REPÈRES OCÉAN N° 12 - 1995

THE SAMBA EXPERIMENT

Volume 1
SAMBA I LAGRANGIAN and CTD DATA

February 1994 - August 1995

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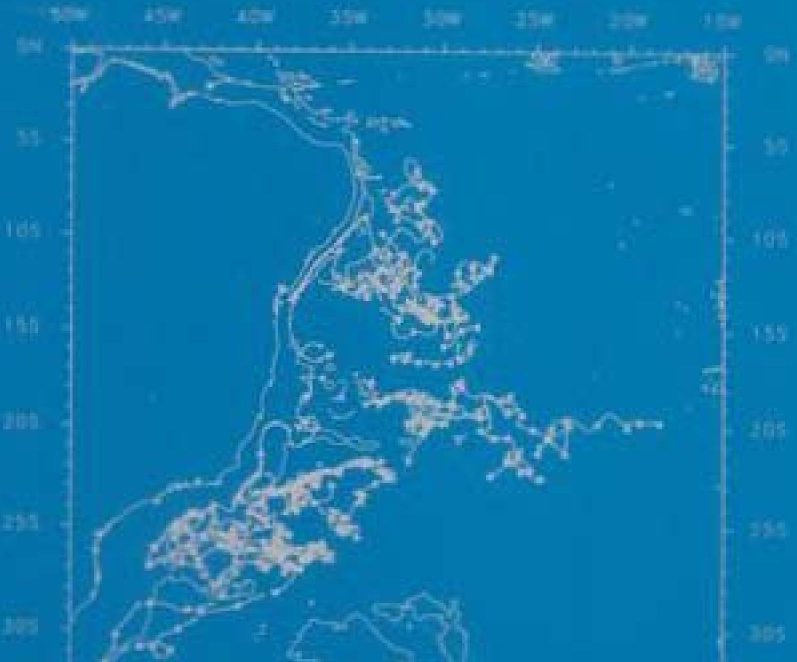

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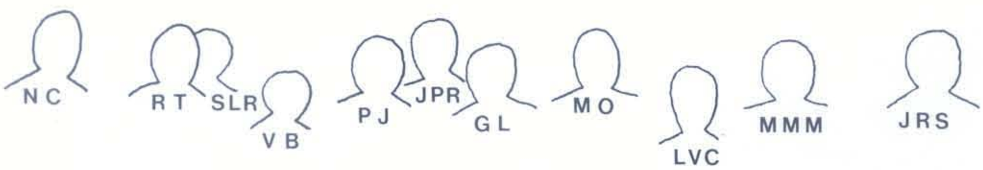
Four MARVOR floats under assemblage at TEKELEC, Les Ulis, France in automn 1993 (photo M. Ollitrault).

A MARVOR float is inside the yellow box. On touching the sea surface the box opens releasing the float (photo M. Ollitrault).



The SAMBA1 team before departure from Montevideo (Uruguay) on February 12th 1994 (photo M. Ollitrault).

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IFREMER

SAMBA is a WOCE float experiment under the responsability of LPO, IFREMER, France.

Lagrangian data published in this data report are from the 20 MARVOR floats, the ALFOS float and the VCM float launched during the SAMBA 1 cruise (February 12, 1994 - February 24,1994). Float data covers one year and a half (February 1994 to August 1995).

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Contents

GLOSSARY

1950JD: "Julian Day" with January 1st 1950 as number 1.
AAIW: AntArctic Intermediate Water.
ALACE: Autonomous LAgrangian Circulation Explorer.
ALFOS: Contraction of ALACE and RAFOS.
ALS: Autonomous Listening Station.
ASCII: American Standard Code for Information Interchange.
BNM: Bureau National de Métrologie.
BPI: Bytes Per Inch.
CITHER: CIrculation THERmohaline.
CLS/ARGOS: Collecte Localisation Satellites par ARGOS.
CMOS: Complementary Metal Oxyde Silicon.
CTD: Conductivity, Temperature and Depth.
DBE: Deep Basin Experiment.
DWBC: Deep Western Boundary Current.
EKE: Eddy Kinetic Energy.
FM: Frequency Modulation.
FURG: Fundação Universidade do Rio Grande.
IFM: Institut Für Meereskunde.
IFREMER: Institut Français de Recherche pour l'Exploitation de la MER.
IMSL: International Mathematical and Statistical Libraries.
IPTS: International Practical Temperature Scale.
IWBC: Intermediate Western Boundary Current.
JD: Julian Day.
LPO: Laboratoire de Physique des Océans.
l. s. : least significant.
MAR: Mid Atlantic Ridge.
MJD: Modified Julian Day.
m. s. : most significant.
NADW: North Atlantic Deep Water.
NIST: National Institute of Standards and Technology.
NOAMP: Nord Ost Atlantisches Monitoring Program.
PSI: Pound weight per Square Inch (1 PSI ≈ 0.689476 dbar).
PTT: Platform Transmitter Terminal.
RAFOS: SOFAR spelled backward.
SAIL: Serial ASCII Instrumentation Loop.
SAMBA: Subantarctic Motions in the Brazil BAsin.
SIO: Scripps Institution of Oceanography.
SOFAR: SOund Fixing And Ranging.
TAI: Temps Atomique International.
TOA: Time Of Arrival.
TOPOGULF: TOPOgraphic GULFstream.
UCPW: Upper Circumpolar Water.
UERJ: Universidade do Estado do Rio de Janeiro.
UNADW: Upper North Atlantic Deep Water.
URI: University of Rhode Island.
UT: Universal Time.
UTC: Universal Time Coordinated.
VCM: Vertical Current Measuring.
WHOI: Woods Hole Oceanographic Institution.
WOCE: World Ocean Circulation Experiment.
WRC: Webb Research Corporation.

LIST OF TABLES

SUMMARY

In February 1994, during the SAMBA1 cruise, 9 CTD casts were done and 22 subsurface floats (20 MARVORs, 1 VCM and 1 ALFOS) launched near 800 dbar in the Brazil basin, within the framework of the SAMBA experiment. SAMBA (SubAntarctic Motions in the Brazil BAsin), is a component of the WOCE float program, and aims at describing the absolute general circulation of the Antarctic Intermediate Water around 800 m depth in the Brazil basin. MARVOR and ALFOS floats cycle every 2 months between their nominal depth and the surface to transmit data via the ARGOS system and were programmed for 30 cycles, i.e. a total life of 5 years. The VCM float, on the other hand is a one shot RAFOS-type float which was programmed for a 1.5 year mission at depth.

This report presents the hydrographic data and the first 18 months of float data obtained so far.

10560 float-days (or 28.9 float-years) have been recovered with the 20 MARVORs, of which, 97 % are in the [700,900] dbar pressure interval. However a few MARVORs sunk to greater depth due to a subtle problem in the hydraulic system (which has since been disclosed and is under solution). 540 float-days were also recovered with the VCM, in the [900,1000] dbar pressure interval, but the ALFOS didn't work so well since we were not able to retrieve any acoustic position, and it stabilized at depths varying between 900 and 1300 dbar (even we are not sure of the pressure transducer calibration).

The 10 MARVOR floats launched in 2 clusters south of the Vitoria-Trindade seamount chain (situated near 21°S) show clearly a mean westward motion associated probably with the northwestern limb of the subtropical anticyclonic gyre, which spans the entire South Atlantic between 45°S and 25°S.

The 10 floats (9 MARVORs and the ALFOS) launched in 2 clusters north of the Vitoria-Trindade chain, reveal almost no mean motion over the 1.5 year but a rather zonal mesoscale dispersion.

Many float pairs launched at the same date but separated by only 30 km, remained together for several months before being shed more than 100 km apart. This reveals the filamentous structure of the oceanic circulation with transverse scale of the order of 30 km.

As a contrast with the rather quiet interior (rms velocities are of the order of a few cm s^{-1}), the 2 floats (1 MARVOR and the VCM) launched near Salvador da Bahia, over the continental slope, were soon advected northward and fast along the coastline showing the presence of a western boundary current at intermediate depths (800 to 900 dbar). This strong (0.5 knot) and narrow (50 km wide) Intermediate Western Boundary Current (IWBC) flowing equatorward has been actually revealed by the floats from 25°S to 2°S. Several "interior" floats were entrained on occasion within the IWBC, then detrained a few months later. South of 28°S there seems to be a southwestward flow only (no equatorward IWBC) which should feed from the north the eastward flow in the confluence region between 40°S and 50°S.

RÉSUMÉ

Au cours de la campagne SAMBA1 dans le bassin du Brésil, en février 1994, neuf stations hydrologiques furent réalisées avec une bathysonde CTD et 22 flotteurs de subsurface (20 MARVORs, un VCM et un ALFOS) furent lâchés vers 800 m de profondeur, dans le cadre de l'expérience SAMBA. SAMBA (pour SubAntarctic Motions in the Brazil BAsin) est une composante du programme flotteur de l'expérience WOCE, et vise à obtenir une description de la circulation générale et absolue (courants moyens, turbulents et phénomènes de mélange inclus) de l'Eau Antarctique Intermédiaire vers 800 m de profondeur, dans le bassin du Brésil et la bande équatoriale, à l'aide de flotteurs lagrangiens.

Les flotteurs MARVOR et l'ALFOS sont de type RAFOS mais cyclent tous les 2 mois entre leur profondeur de consigne et la surface pour retransmettre leurs informations via les satellites du système ARGOS, et ont été programmés pour 30 cycles, soit une durée de vie de 5 ans. Le flotteur VCM par contre est un flotteur de type RAFOS "à un seul coup", et avait été programmé pour une mission de 1 an et demi en profondeur.

Ce rapport présente les données hydrologiques recueillies et les 18 premiers mois de données flotteurs obtenues jusqu'à présent.

10560 jours (soit 28.9 années) de données flotteurs ont été récupérées par les 20 flotteurs MARVOR, dont 97 % concernent l'intervalle de pression [700,900] dbar. Quelques MARVORs néanmoins ont présenté en quelques ocasions un enfoncement anormal, à de plus grandes profondeurs, causé par un problème subtil d'étanchéité d'une électrovanne du bloc hydraulique (qui est heureusement aujourd'hui en cours de solution).

540 jours de données ont aussi été récupérés par le VCM, mais dans l'intervalle de pression [900,1000] dbar. L'ALFOS pour sa part n'a pas très bien fonctionné puisque nous n'avons pu calculer aucune position "acoustique", et qu'il s'est stabilisé, au cours de ses différents cycles à des profondeurs variant entre 900 et 1300 dbar (et encore il subsiste une incertitude sur l'étalonnage du capteur de pression).

Les dix flotteurs MARVOR lâchés en deux paquets, au sud de la chaîne de monts sous-marins Vitoria-Trindade (située vers 21°S) montrent clairement un mouvement d'ensemble vers l'ouest sud-ouest, quasi-permanent, associé vraisemblablement au quart nord-ouest du tourbillon anticyclonique subtropical, qui s'étent zonalement dans l'Atlantique Sud entre 45°S et 25°S.

Les dix flotteurs (9 MARVORs et l'ALFOS) lâchés aussi en deux paquets, mais au nord de la chaîne Vitoria-Trindade, révèlent qu'il n'y a pas de mouvement d'ensemble après 1 an et demi, mais seulement une circulation turbulente d'échelle moyenne avec tendance à une dispersion plutôt zonale.

De nombreuses paires de flotteurs lâchés simultanément mais en des points séparés d'environ une trentaine de km, ne se séparent de plus de 100 km qu'après plusieurs mois. Ce qui révèle une structure filamentaire de la circulation océanique d'échelle transversale de l'ordre de la trentaine de km, et une dispersion faible à cette échelle.

Contrastant avec le calme relatif de l'intérieur (les vitesses quadratiques moyennes sont d'environ quelques cm s^{-1}), les deux flotteurs (un MARVOR et un VCM) lâchés près de Salvador da Bahia, au-dessus de la pente continentale, ont été aussitôt entrainés vers le nord, rapidement, et en restant collés à la pente continentale, démontrant la présence d'un courant de bord ouest portant vers le nord aux profondeurs intermédiaires (800 à 900 dbar). Ce courant intermédiaire de bord ouest (CIBO) intense (de l'ordre de 0,5 noeud) et étroit (largeur de l'ordre de 50 km) a en fait été révélé par les flotteurs entre 25°S et 2°S. Plusieurs flotteurs "intérieurs" ont été entrainés dans ce CIBO, puis expulsés quelques mois plus tard, pour être repris parfois dans le CIBO, un peu plus tard.

Au sud de 28°S, par contre il semble qu'il n'y ait qu'un flux vers le sud-ouest, (et pas de CIBO vers l'équateur) qui devrait alimenter par le nord l'écoulement vers l'est dans la zone de confluence entre 40°S et 50°S.

1 INTRODUCTION

The rather recent recognition that oceanic currents transport as much heat as the atmosphere from the equatorial regions towards higher latitudes (Vonder Haar and Oort, 1973), thus contributing largely to the climatic balance of the earth fluid envelope (Gill, 1982), has prompted the planning and eventually the realisation of the World Ocean Circulation Experiment (WOCE).

WOCE objectives are to obtain before the end of the 20^{th} century, a comprehensive description and an understanding of the 3D general circulation of the World Ocean over a reasonably short period (of the order of 5 years) and with a sufficient spatial resolution. Results will be used later to design, improve and initialize climate-oriented, coupled ocean-atmosphere models. Naturally, all the measurements done during WOCE (hydrographic and geochemical sections, eulerian and lagrangian current measurements, tide gauge and satellite altimetric sea surface heights) will sample various time and space scales and will be valuable in the study of all ocean processes (Needler, 1992).

An order of 1000 subsurface lagrangian floats will be deployed during WOCE at various depths to estimate the absolute general circulation (mean and variable). The absolute mean circulation at those depths will be used in turn as velocity reference levels for an "inversion" of the WOCE hydrographic data, enabling the absolute 3D deep circulation to be resolved (Mercier, Ollitrault and Le Traon, 1993).

SAMBA (SubAntarctic Motions in the Brazil BAsin), a component of the WOCE float program, aims at describing the absolute general circulation of the Antarctic Intermediate Water (AAIW) as it spreads northward, around 800 m, in the Brazil basin. For the SAMBA experiment, a total of 100 MARVOR floats should be launched before Spring 1997 at 800±30 dbar in the Brazil Basin for a 5-year mission. Acoustic tracking is made possible with an array of 19 sound sources covering the whole basin deployed in close cooperation between IFM Kiel, LPO/IFREMER and WHOI. These sources emit either daily or every 2 days. It is hoped that with 5 years of float data in each one of the 100 boxes of 2° lat by 5° long covering the entire Brazil basin, the absolute mean general circulation of the AAIW will be resolved, at least for spatial scales greater than a few hundreds of km, with a few mm s^{-1} accuracy.

20 MARVOR, one ALFOS and one VCM floats were launched around 800 dbar during the SAMBA1 cruise from R.V. Le Suroît between 18 and 24 February 1994 at 5 main sites in the Brazil basin. Besides these SAMBA floats proper, 10 RAFOS floats from WHOI (5 ballasted for 2500 dbar, and 5 for 4000 dbar) were launched. Nine CTD stations were done.

This data report presents the CTD observations and one year and a half of lagrangian observations from the 20 MARVORs, the ALFOS and the VCM.

2 THE FIELD EXPERIMENT

2.1 The SAMBA1 cruise

The SAMBA1 cruise, on board R.V. Le Suroît, departed from Montevideo (Uruguay) on February 12^{th} 1994 and ended in Salvador da Bahia (Brazil) on February 24^{th} 1994.

20 MARVORs, one ALFOS[1] and one VCM were launched within a week (between 18 and 24 February 1994) at 5 main sites in the Brazil basin (Fig. 1).

At each of the first 4 sites, situated in the interior of the basin, 5 floats were launched in a cluster (cross shaped, with 25 km arms) to study the mesoscale dispersion. Only 4 MARVORs were launched, however, at the fourth site, the fifth float being the ALFOS. The 20^{th} MARVOR and the VCM were launched at the fifth site near the Brazilian coast, in the presumed Intermediate Western Boundary Current (IWBC) of Antarctic Intermediate Water (AAIW) around 800 dbar.

The MARVORs were programmed for 30 2-month cycles at 800±30 dbar, the ALFOS and VCM, both ballasted for 800 dbar, were programmed for 50 2-month cycles and a 548-day mission at depth respectively (the VCM is a one-shot float).

10 RAFOS floats from WHOI were also launched during the SAMBA1 cruise. 5 were ballasted for 2500 dbar and 5 for 4000 dbar.

One CTD station was done at the center point of each of the four clusters of the basin interior. 5 CTD stations (at a 10 nautical miles spacing) were done before reaching Salvador, over the continental slope region to map the IWBC hydrographic structure (Fig. 2).

The SAMBA1 cruise track almost exactly follows the CITHER2 cruise (21/01/1994-23/02/1994) track during which the WOCE A17 hydrographic section was completed (Fig. 3), so that SAMBA1 float data can be combined later (optimally) with CITHER2 hydrographic data.

Table 1 summarizes the SAMBA1 cruise activity.

1.It is precisely a prototype ALFOS (ALACE + RAFOS) that was launched. However acoustic reception did not work well, and we have used the float exactly like an ALACE (see Sections 4.3 and 4.7).

Table 1 SAMBA1 cruise activity

STATION	EVENT	LATITUDE	LONGITUDE	DATE	OBS.
S1P0	RAFOS Nº179 4000 dbar	27°29.9'S	38°00.6'W	17/02/94 13h22 UT	
S1P1	MARVOR Nº101 800 dbar	26°40.1'S	36°15.0'W	18/02/94 00h05 UT	
S1P2	MARVOR Nº102 800 dbar	26°21.0'S	36°15.9'W	02h08 UT	
S1P3	CTD Nº1	26°30.0'S	36°05.0'W	05h00 UT	
	MARVOR Nº103 800 dbar	26°29.7'S	36°05.2'W	06h58 UT	
	RAFOS Nº156 4000 dbar	26°29.6'S	36°05.3'W	07h05 UT	
	RAFOS Nº159 2500 dbar	26°29.5'S	36°05.3'W	07h11 UT	
S1P4	MARVOR Nº104 800 dbar	26°39.1'S	35°54.2'W	08h58 UT	
S1P5	MARVOR Nº105 800 dbar	26°19.9'S	35°55.0'W	10h56 UT	
S1P6	MARVOR Nº106 800 dbar	22°41.0'S	32°58.0'W	19/02/94 13h04 UT	
S1P7	MARVOR Nº107 800 dbar	22°22.5'S	33°02.0'W	15h01 UT	
S1P8	CTD Nº2	22°29.7'S	32°50.2'W	17h50 UT	
	MARVOR Nº108 800 dbar	22°29.8'S	32°50.3'W	19h08 UT	
	RAFOS Nº196 4000 dbar	22°29.7'S	32°50.2'W	19h13 UT	
	RAFOS Nº194 2500 dbar	22°29.6'S	32°50.2'W	19h18 UT	
S1P9	MARVOR Nº109 800 dbar	22°37.5'S	32°38.1'W	20h58 UT	
S1P10	MARVOR Nº110 800 dbar	22°19.0'S	32°42.0'W	22h53 UT	
S1P11	MARVOR Nº111 800 dbar	18°43.5'S	31°20.0'W	20/02/94 21h11 UT	
S1P12	MARVOR Nº112 800 dbar	18°30.0'S	31°34.2'W	23h02 UT	
S1P13	CTD Nº3	18°30.0'S	31°20.0'W	21/02/94 02h00 UT	Salinity is noisy
	MARVOR Nº113 800 dbar	18°28.7'S	31°21.6'W	03h34 UT	
S1P14	MARVOR Nº114 800 dbar	18°30.1'S	31°06.0'W	05h24 UT	
S1P15	MARVOR Nº115 800 dbar	18°16.4'S	31°20.0'W	07h22 UT	
S1P15A	RAFOS Nº199 4000 dbar	17°30.1'S	31°15.0'W	12h00 UT	
	RAFOS Nº193 2500 dbar	17°30.0'S	31°15.0'W	12h05UT	
S1P16	MARVOR Nº116 800 dbar	14°28.0'S	30°59.6'W	22/02/94 05h24 UT	
S1P17	MARVOR Nº117 800 dbar	14°15.0'S	30°46.1'W	07h26 UT	
S1P18	CTD Nº4	14°14.5'S	31°00.0'W	10h30 UT	
	ALFOS Nº2 800 dbar	14°14.1'S	31°00.4'W	12h27 UT	
	RAFOS Nº198 4000 dbar	14°14.3'S	31°00.4'W	12h32 UT	
	RAFOS Nº195 2500 dbar	14°14.4'S	31°00.4'W	12h37 UT	
S1P19	MARVOR Nº119 800 dbar	14°01.5'S	31°00.0'W	14h02 UT	
S1P20	MARVOR Nº120 800 dbar	14°15.1'S	31°13.9'W	15h59 UT	

Table 1 SAMBA1 cruise activity

STATION	EVENT	LATITUDE	LONGITUDE	DATE	OBS.
S1P21	CTD Nº5	13°16.3'S	37°34.9'W	24/02/94 02h30 UT	
S1P22	CTD Nº6	13°14.5'S	37°45.5'W	06h20 UT	
	RAFOS Nº197 2500 dbar	13°14.7'S	37°45.7'W	07h30 UT	
S1P23	CTD Nº7	13°12.7'S	37°55.0'W	10h00 UT	
	VCM Nº19 800 dbar	13°12.3'S	37°55.5'W	11h04 UT	
S1P24	MARVOR Nº118 800 dbar	13°10.7'S	38°04.8'W	13h15 UT	
	CTD Nº8	13°10.7'S	38°04.8'W	14h00 UT	
S1P25	CTD Nº9	13°09.5'S	38°15.6'W	16h35 UT	

2.2 Other works at sea

To cover the region where our floats could wander, that is the Brazil basin and the equatorial Atlantic, standard WRC sound sources were moored (some recovered, and remoored after check) at 19 different positions, between October 1992 and January 1995, by IFM Kiel, LPO/IFREMER and WHOI (Fig. 4)[1]. The sound source array was designed jointly by scientists from the above 3 institutes (M. Ollitrault (LPO), B. Owens (WHOI) and W. Zenk (IFM)), within the framework of the Deep Basin Experiment (DBE). Sound sources emit either daily (the Kiel ones : K1, K2, K3, K4, KB, K6, and the Brest ones : B1, B2, B3 and B4) or every two days (the Woods Hole ones : 46, 51, 52, 53, 54, 69, 75, 76 and 77). However, in February, March and April 1995 the 9 American sources were recovered, new batteries added and the emission rate changed to one daily. They were then remoored at the same nominal position.

Appendix D gives the sound source characteristics.

1.The B3 sound source however didn't functionned and was recovered in Spring 1995.

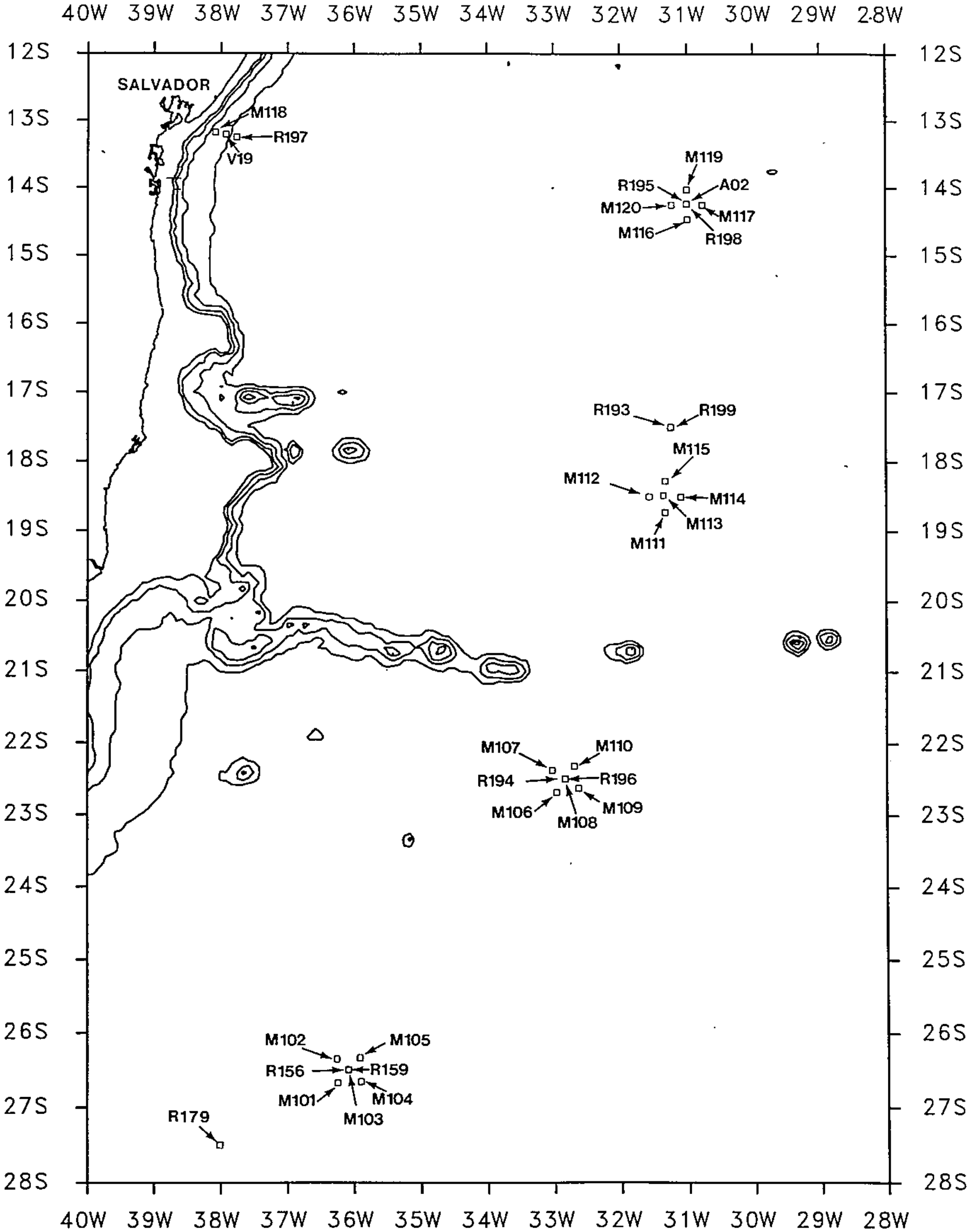


Figure 1 Float launch sites during the SAMBA1 cruise. MARVOR floats are denoted as M101 to M120, ALFOS as A02 and VCM as V19. These 22 floats were aimed at drifting near 800 dbar. 10 US RAFOS were also launched during the cruise by R. Tavares (WHOI). They are denoted as R followed by their serial number (5 were ballasted for 2500 m, 5 for 4000 m).

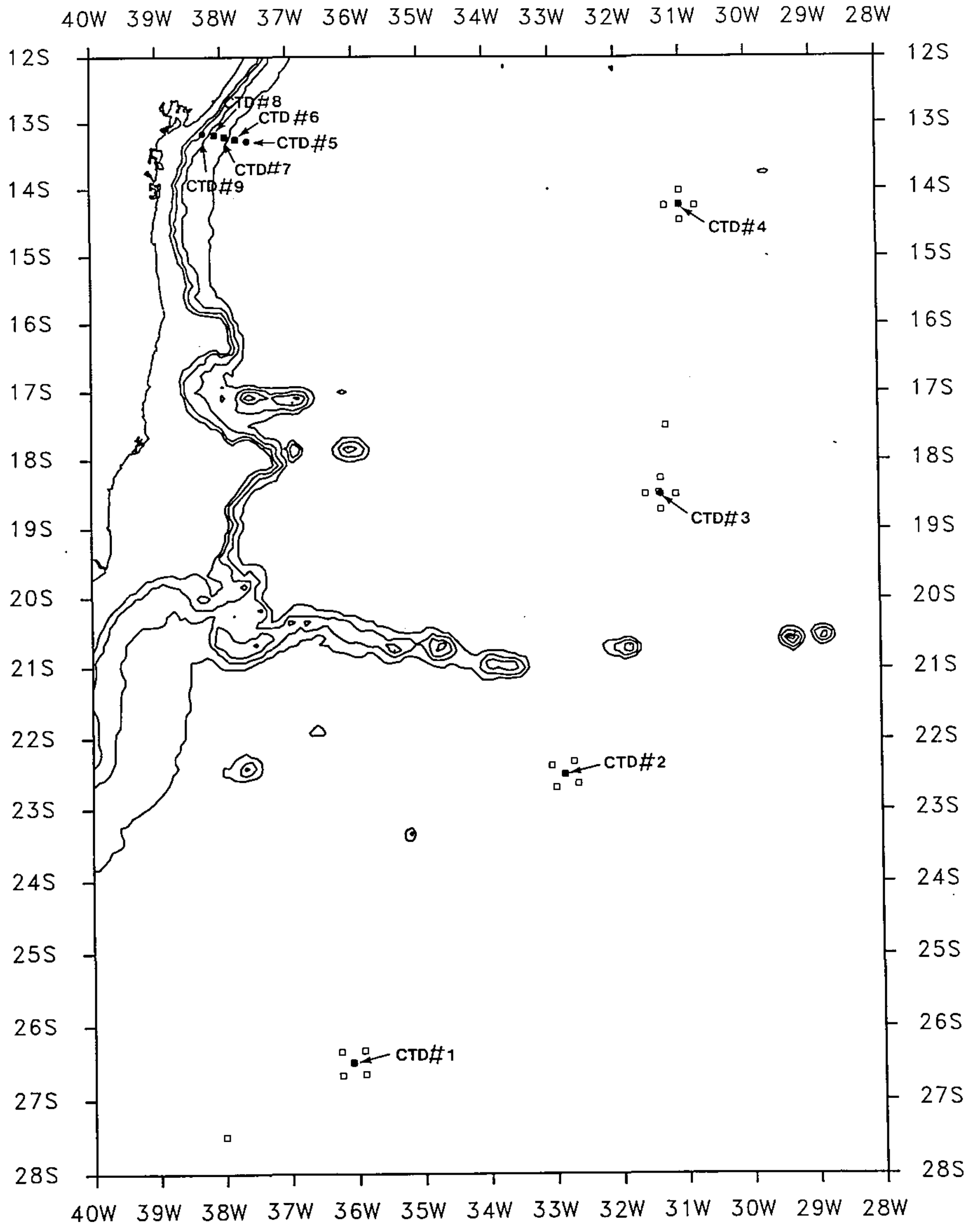


Figure 2 Float launch sites and CTD station positions (indicated by full dots and numbered 1 to 9) in the Brazil basin and near Salvador da Bahia (Brazil).

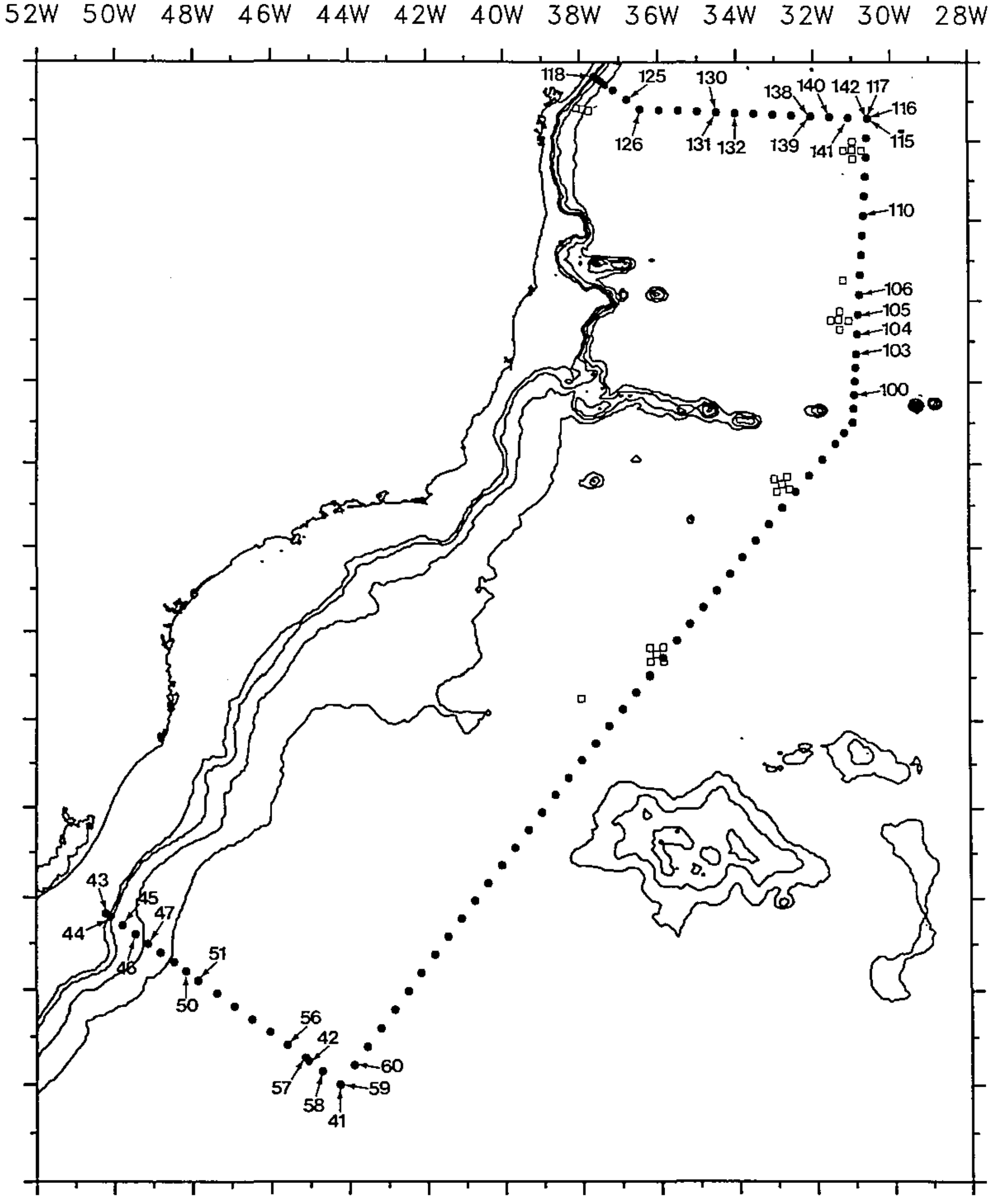


Figure 3 CTD station positions (WOCE WHP section A17) of the CITHER2 cruise (January 21st 1994 to February 23rd 1994) together with SAMBA1 float launch sites.

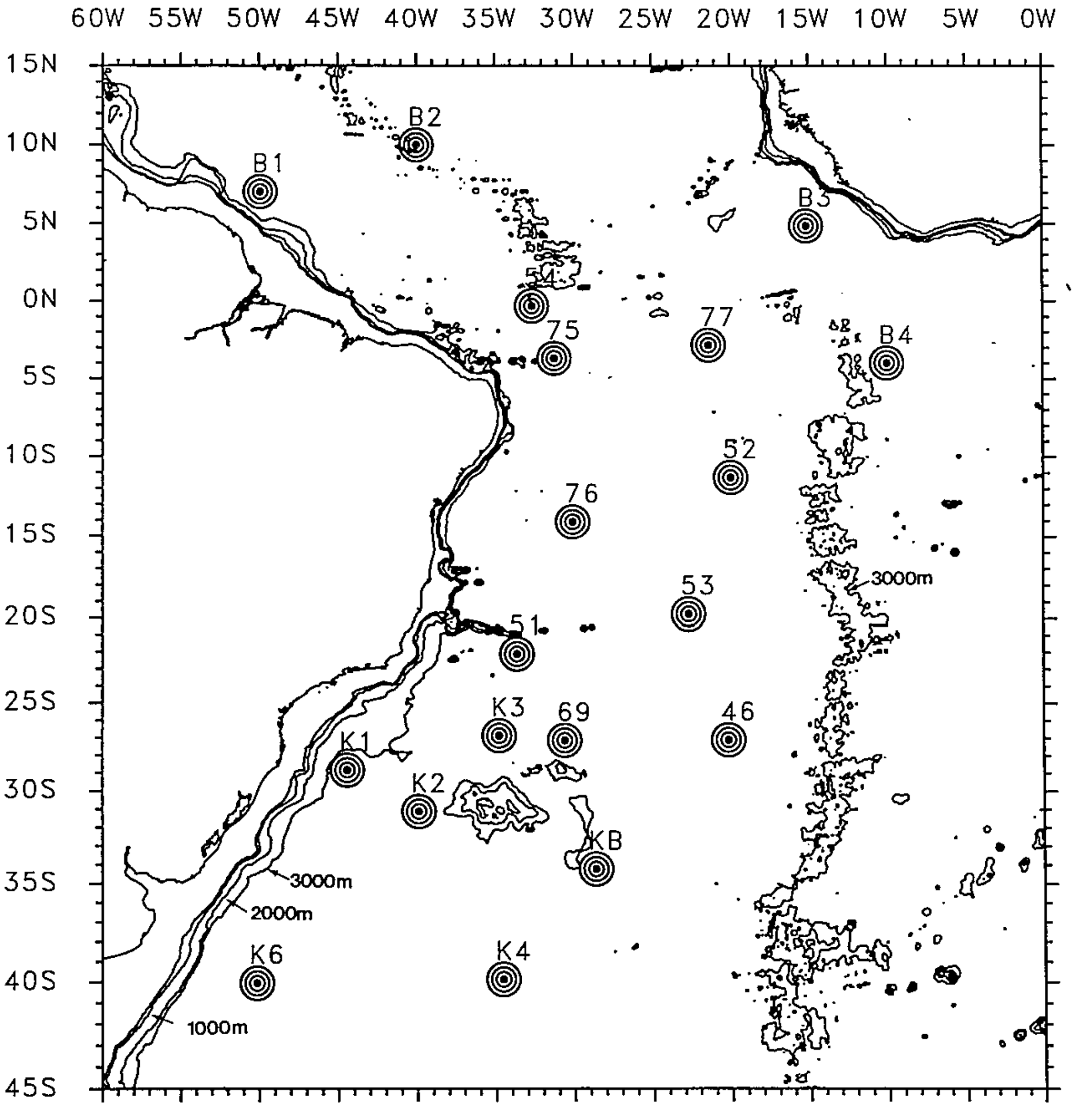


Figure 4 Sound source array in the southwest Atlantic and Equatorial Atlantic, used for tracking RAFOS type floats in the region. These sources emit either daily or every two days. Main pong times are at 0h30, 1h00 or 1h30 UT (see Appendix D for details).

3 HYDROGRAPHIC MEASUREMENTS

3.1 Data acquisition and processing

During the SAMBA1 cruise hydrographic data were acquired with a Sea-Bird Electronics (SBE) model 25 CTD probe. Data was transferred in real-time to a PC computer on board the ship via the cable and preprocessed by the manufacturer software (Seasave program in particular). Pressure, temperature and conductivity were sampled at 8 scans per second. They were then averaged every second over 8 scans, by the PC and finally the salinity computed. P, T and S values stored in binary files named .dat, were once more averaged, over 5 dbar pressure intervals and stored in ASCII files named .avg. These latter files preserved on 3.5" disquettes constitute our basic data files.

The CTD was calibrated for T and P before (in December 1993) and after (in September 1994) the SAMBA1 cruise, by Mrs Martine Cambon (IFREMER Metrology Lab).

There was a nearly constant offset of + 0.006°C between a reference platinum thermometer and the temperature given by the CTD. For the pressure, differences with a Desgranges and Huot deadweight tester never exceeded ±5 dbar, and were generally within ±3 dbar.

We have thus decided to add + 0.006°C to the CTD temperature values.

According to Martine Cambon, we can assume the following accuracies for the P and T measurements : $\Delta p \approx \pm 10^{-3} p \ (2\sigma)$ and $\Delta T \approx \pm 0.015\ ^\circ C \ (2\sigma)$. However accuracy on T is probably better.

The conductivity cell has only been calibrated by the manufacturer in August 1992. However previous calibrations, have shown a drift smaller than 0.01 $mS.cm^{-1}$ over one year. Consequently it is hoped that salinity is accurate to ±0.01 PSU (an error on T of ±0.005°C implies an error on S of ±0.005 PSU, while an error on p of ±5 dbar implies an error on S of ±0.002 PSU).

Each station file (.avg) was cut into 2 files corresponding to down and up profiles. These latter files are written using the exchange format, designed by the LPO hydrographic group. As an example, the beginning of the SAMBA1 CTD station #1 is given below. The format is self explanatory.

```
  1        SAMBA1          SUROIT   SB
*No station,nom campagne,nom navire,type de sonde
*(i3,2(1x,a16),1x,a6)
18021994 0500 S  26 30.00 W  36  5.00  3  3867 4414   0 4144
*Date,heure,lat.,lon.,nb parametres,nb mesures,fond,pmin,pmax
*(a8,1x,a4,1x,a11,1x,a11,1x,a2,1x,a5,3(1x,a4))
PRESSION             dbar
TEMPERATURE          deg.cels.
SALINITE             p.s.u.
*(f6.1,1x,f6.3,1x,f6.3)
   0.3 27.531 36.289
   0.3 27.532 36.291
```

0.3	27.531	36.291
1.2	27.531	36.291
0.3	27.531	36.291
1.2	27.530	36.291
1.2	27.530	36.291
1.2	27.530	36.292
1.2	27.530	36.291
1.2	27.530	36.291
2.2	27.528	36.290
2.2	27.529	36.290
2.2	27.530	36.291
2.2	27.528	36.290
4.1	27.524	36.288
5.0	27.526	36.289
5.0	27.528	36.290
6.0	27.528	36.290
6.0	27.528	36.290
6.9	27.528	36.290
7.9	27.528	36.289
8.9	27.526	36.289
8.9	27.527	36.290
9.8	27.528	36.290
10.8	27.528	36.290
10.8	27.528	36.290

Only the down profiles have been processed further. First, data are preserved only for increasing pressure with averaging of T and P values if the corresponding pressures are equal. The effect of this procedure is illustrated with SAMBA1 CTD station #1 (Fig. 5). Finally data are linearly interpolated at every integral pressure value in dbar. Final ASCII files are named Samba10001.ecp to Samba10009.ecp.

Specific processing for CTD station #3

Due to the opening of the pipe connecting the conductivity cell to the pump, salinity values obtained for the third CTD station are rather noisy. The obviously bad salinity values (for example spikes) were first removed from the down profile file through a visual inspection of the salinity profile, and by comparing it to the nearest stations done during CITHER2 (#104 and #105), as well as to SAMBA1 stations #2 and #4.

Then salinity values were filtered with a rectangular filter of width 20 dbar (but not the temperature values). Finally, data were linearly interpolated to every integral dbar.

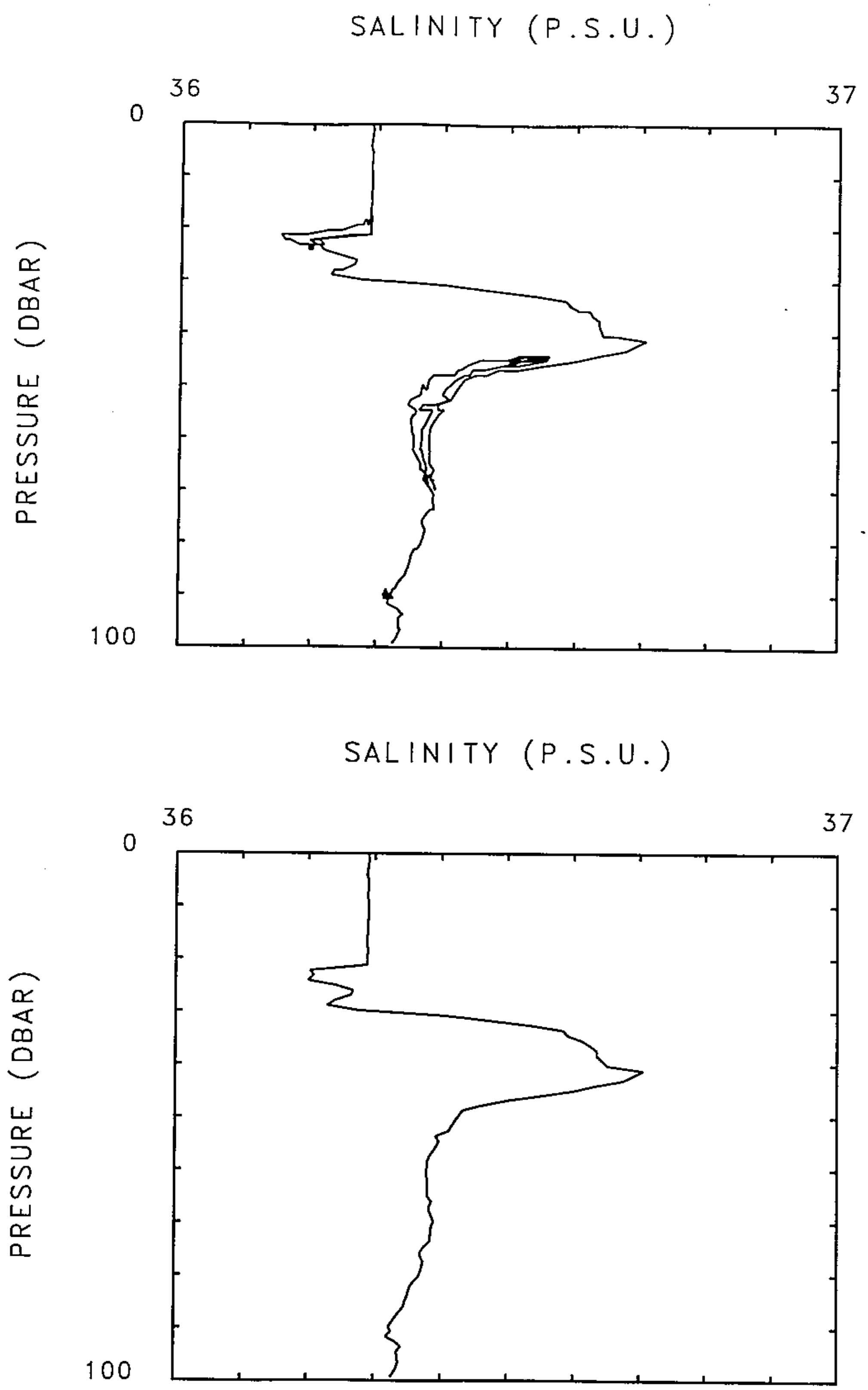


Figure 5 Raw data from SAMBA1 CTD station #1 (top of the figure). Preserved data after increasing pressure filtering (bottom of the figure).

3.2 Hydrographic data (IPTS 90)

For each of the 9 CTD stations done during SAMBA1, one will find (pages 24 to 39):

1- A listing of T, S, θ, $\sigma_{in\ situ}$, V_{sound}, σ_0, σ_1 and ΔD for pressure values of 10, 20, ..., 90, 100, 150, 200, ..., 950, 1000, 1100, ..., pmax (for the 5 stations situated over the continental slope near Salvador, 50 dbar increments are used down to 2000 dbar).

The dynamic height anomaly ΔD (unit is dyn.m or 10 J kg^{-1} or 10 m^2 s^{-2}) is obtained as : $\Delta D\,(p) \;=\; \int_{p_{ref}}^{p} -dp'\left(\frac{1}{\rho_{in\ situ}} - \alpha_{35,0,p'}\right)$ and the reference pressure is 3500 dbar for stations #1 to #4, 1300 dbar for stations #5 to #9.

2- A drawing of the θ, S, $\sigma_{in\text{-}situ}$, sound speed and buoyancy frequency.

The buoyancy frequency was obtained as follows : N^2 is estimated at each dbar by moving adiabatically the water particle 10 meters up and down, then N^2 is filtered with a rectangle filter of 40 dbar width. The few negative values which still occurred near the surface were put to zero. Then the buoyancy frequency (unit cph) is calculated by $\frac{N \cdot 3600}{2\pi}$, since N is given in rad.s^{-1}.

3.3 Hydrographic preliminary results

θ-S diagrams are given for the 4 CTD stations in the basin interior (Fig. 6) and the 5 stations done near Salvador (Fig. 7). They show clearly AAIW (cool and fresh) near 27.2-27.3 σ_0, deeper in the South (salinity minimum is near 900 m at 26°30'S, near 800 m at 14°15'S). NADW is evident by its high salinity between 1500 and 3800 m, while in between, interleaving occurs with UCPW (between 32.0 σ_1 and 36.95 σ_2).

The sound speed profiles show a pronounced minimum around 800 m depth related of course to AAIW, which allows very long transmission of acoustic signals for emitters situated near this so-called SOFAR channel axis.

Surface waters are very salty and warm as is usual in the tropics (see e.g. Bainbridge, 1980), with a well mixed homogeneous surface layer 30 to 50 m thick. The Salvador section (stations #5 to #9) shows an intense (max of 40 cm.s^{-1}) northward flowing geostrophic (with an assumed level of no motion at 1100 dbar) current centered around 300 m, entraining AAIW to the north, and a southward flowing current (max 30 cm.s^{-1}) centered around 1900 m, within NADW (Fig. 8). Although our 5 stations span only 75 km over the continental slope, they do show an IWBC carrying AAIW and Central waters northward and a DWBC carrying UNADW southward, with a width probably not greater than 100 km.

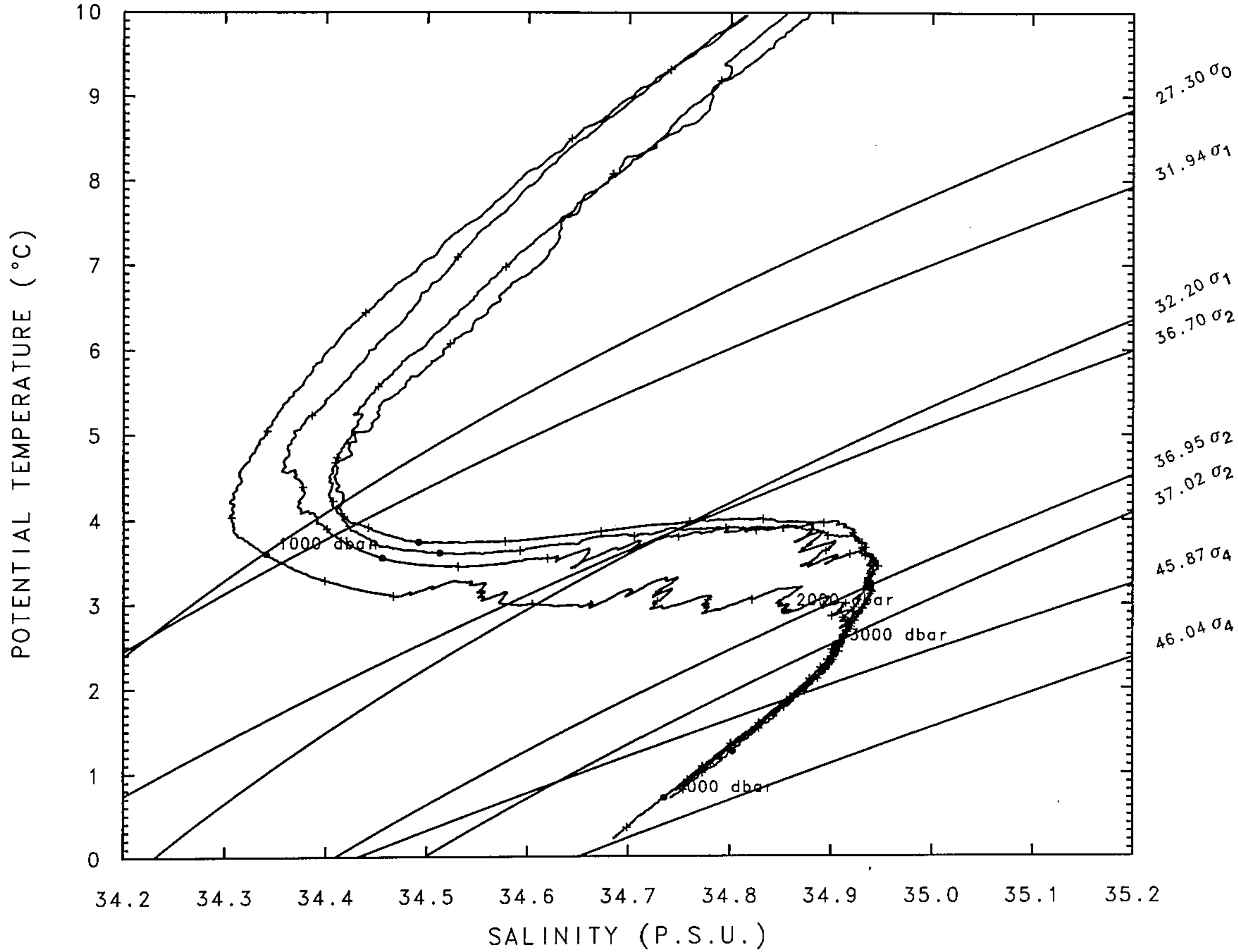


Figure 6 θ-S diagram for SAMBA1 CTD stations #1, #2, #3 and #4.

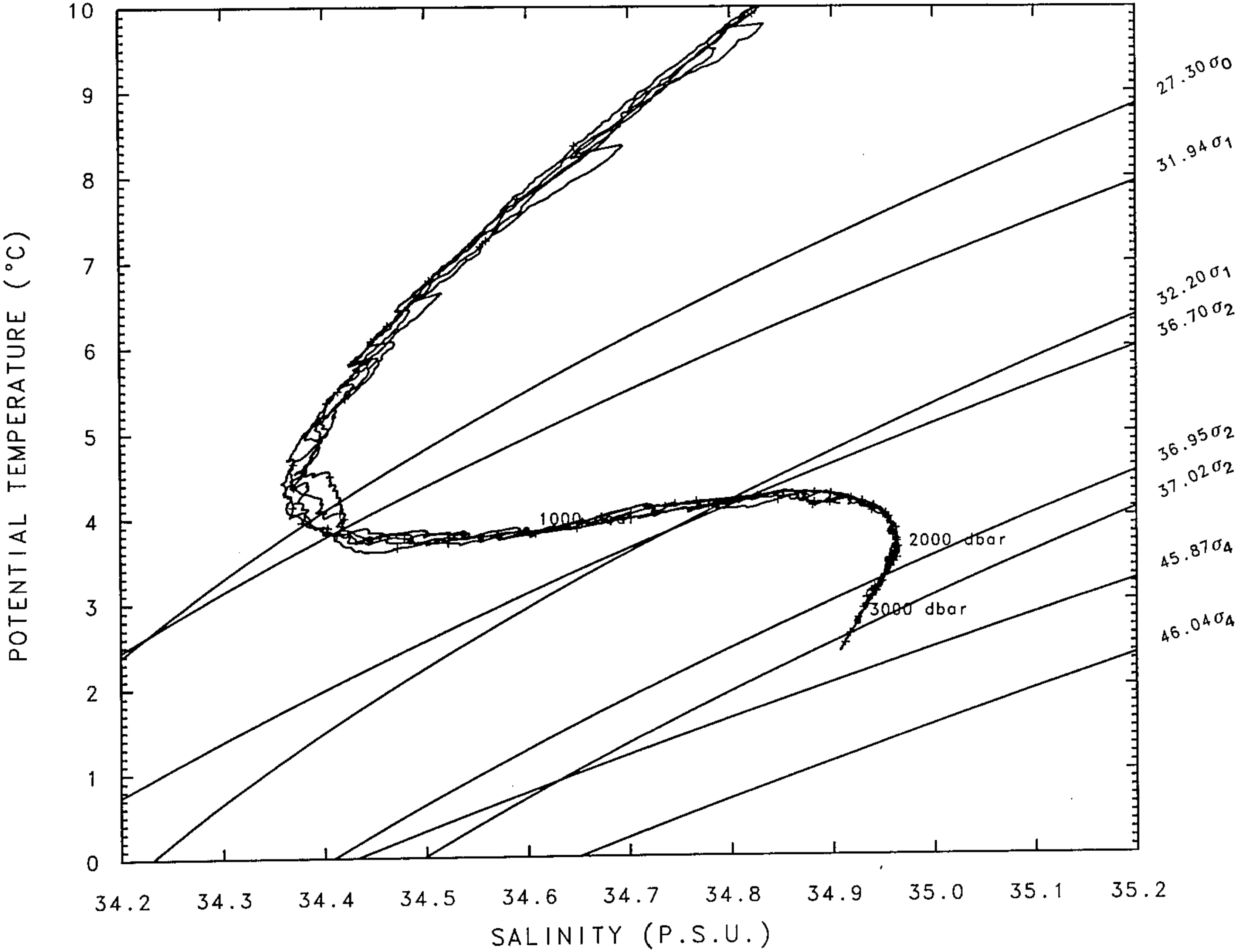


Figure 7 θ-S diagram for SAMBA1 CTD stations #5, #6, #7, #8 and #9.

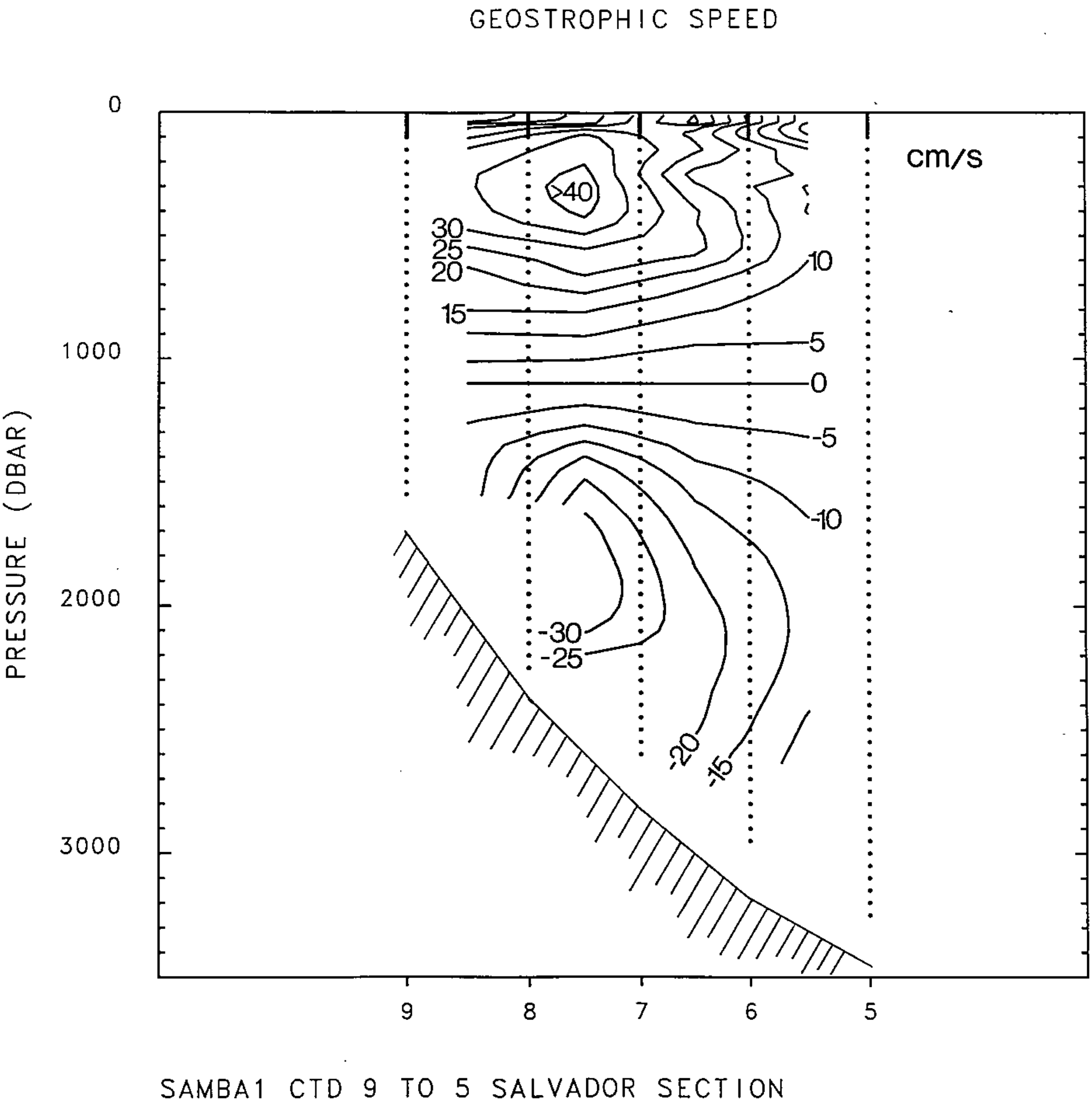
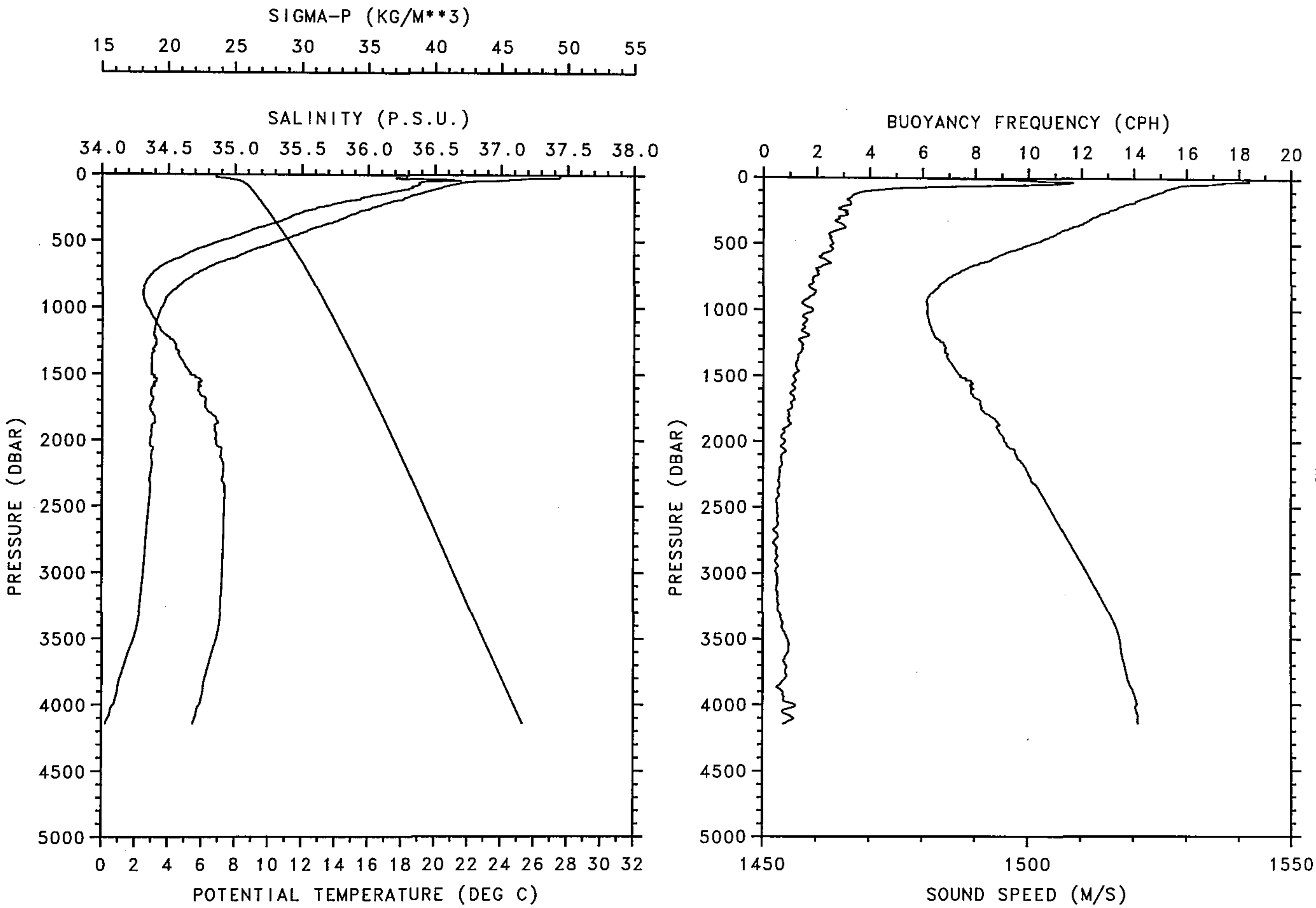


Figure 8 Geostrophic velocities normal to the Salvador CTD section. Assumed level of no motion at 1100 dbar.

Station : 1	Cruise : SAMBA1
Date : 18-02-94	Ship : SUROIT
Bottom depth: 4414 m	Institute: IFREMER
Position : S 26 30.00 W 36 5.00	

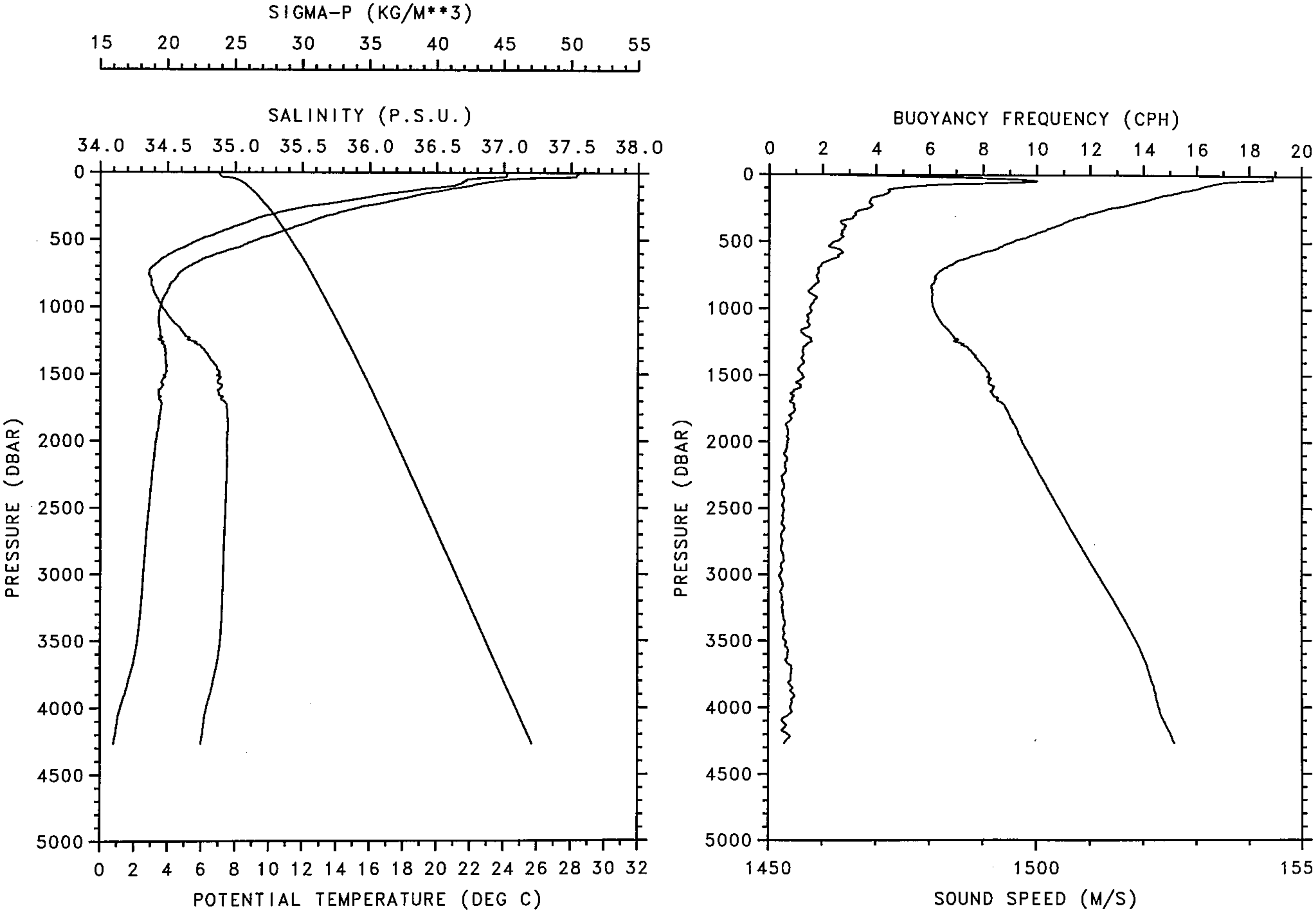
PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	27.534	36.290	27.532	23.560	1541.813	23.518	27.679	2.803
20.0	27.537	36.289	27.532	23.601	1541.987	23.517	27.678	2.760
30.0	25.224	36.301	25.217	24.385	1536.834	24.258	28.448	2.720
40.0	24.394	36.648	24.385	24.944	1535.375	24.774	28.973	2.686
50.0	22.208	36.425	22.198	25.459	1529.797	25.245	29.475	2.657
60.0	21.575	36.379	21.563	25.646	1528.256	25.389	29.628	2.631
70.0	21.248	36.388	21.234	25.787	1527.566	25.487	29.731	2.605
80.0	20.832	36.368	20.817	25.929	1526.595	25.586	29.837	2.581
90.0	20.479	36.324	20.462	26.035	1525.757	25.648	29.905	2.557
100.0	20.337	36.324	20.318	26.117	1525.536	25.687	29.946	2.533
150.0	18.833	36.061	18.806	26.531	1521.876	25.882	30.166	2.421
200.0	17.426	35.824	17.392	26.922	1518.351	26.052	30.361	2.316
250.0	16.214	35.609	16.174	27.268	1515.287	26.176	30.507	2.217
300.0	15.013	35.451	14.967	27.643	1512.200	26.327	30.681	2.125
350.0	14.148	35.344	14.097	27.973	1510.140	26.433	30.803	2.038
400.0	12.808	35.175	12.753	28.349	1506.363	26.578	30.975	1.956
450.0	11.887	35.050	11.828	28.660	1503.922	26.661	31.077	1.880
500.0	10.722	34.899	10.661	28.991	1500.515	26.758	31.199	1.808
550.0	9.564	34.759	9.501	29.317	1497.021	26.848	31.315	1.740
600.0	8.567	34.643	8.503	29.623	1494.033	26.917	31.407	1.676
650.0	7.511	34.535	7.446	29.936	1490.733	26.990	31.505	1.615
700.0	6.510	34.439	6.445	30.240	1487.555	27.052	31.592	1.559
750.0	5.748	34.381	5.683	30.532	1485.286	27.103	31.662	1.505
800.0	5.115	34.342	5.049	30.816	1483.508	27.148	31.723	1.453
850.0	4.591	34.314	4.524	31.092	1482.154	27.185	31.774	1.404
900.0	4.102	34.307	4.034	31.377	1480.945	27.231	31.833	1.357
950.0	3.866	34.317	3.796	31.643	1480.799	27.264	31.871	1.312
1000.0	3.671	34.341	3.598	31.915	1480.838	27.302	31.915	1.269
1100.0	3.360	34.399	3.282	32.456	1481.256	27.379	32.000	1.188
1200.0	3.181	34.467	3.096	32.988	1482.244	27.451	32.076	1.113
1300.0	3.228	34.554	3.134	33.507	1484.221	27.517	32.140	1.045
1400.0	3.106	34.605	3.005	34.017	1485.434	27.569	32.196	0.981
1500.0	3.101	34.663	2.992	34.517	1487.156	27.617	32.243	0.922
1600.0	3.148	34.728	3.030	35.015	1489.112	27.665	32.290	0.866
1700.0	3.173	34.778	3.045	35.503	1490.957	27.704	32.328	0.812
1800.0	3.186	34.822	3.049	35.986	1492.745	27.738	32.362	0.762
1900.0	3.150	34.849	3.005	36.462	1494.304	27.764	32.389	0.714
2000.0	3.064	34.854	2.911	36.927	1495.624	27.777	32.404	0.667
2100.0	3.150	34.893	2.986	37.393	1497.722	27.801	32.426	0.620
2200.0	3.177	34.915	3.003	37.853	1499.549	27.817	32.441	0.575
2300.0	3.036	34.901	2.855	38.309	1500.618	27.819	32.447	0.530
2400.0	3.088	34.923	2.896	38.763	1502.556	27.833	32.460	0.485
2500.0	3.026	34.921	2.826	39.216	1503.980	27.838	32.467	0.441
2600.0	2.960	34.917	2.751	39.666	1505.386	27.842	32.472	0.396
2700.0	2.906	34.915	2.688	40.116	1506.849	27.846	32.478	0.352
2800.0	2.851	34.912	2.624	40.564	1508.307	27.849	32.483	0.307
2900.0	2.795	34.910	2.559	41.012	1509.766	27.853	32.489	0.263
3000.0	2.742	34.907	2.497	41.459	1511.237	27.856	32.494	0.218
3100.0	2.673	34.903	2.419	41.906	1512.641	27.859	32.499	0.174
3200.0	2.598	34.897	2.335	42.353	1514.019	27.862	32.504	0.130
3300.0	2.516	34.890	2.245	42.799	1515.367	27.864	32.509	0.086
3400.0	2.387	34.879	2.108	43.249	1516.511	27.866	32.515	0.043
3500.0	2.182	34.860	1.898	43.706	1517.319	27.868	32.522	0.000
3600.0	1.873	34.829	1.586	44.170	1517.661	27.867	32.530	-0.041
3700.0	1.634	34.801	1.343	44.624	1518.305	27.862	32.533	-0.080
3800.0	1.368	34.773	1.074	45.083	1518.830	27.858	32.537	-0.117
3900.0	1.219	34.758	0.918	45.532	1519.882	27.856	32.540	-0.153
4000.0	1.006	34.735	0.701	45.985	1520.644	27.852	32.542	-0.188
4100.0	0.652	34.699	0.347	46.451	1520.761	27.844	32.545	-0.220
4144.0	0.522	34.685	0.216	46.654	1520.927	27.840	32.545	-0.233



samba10001.ecp

Station : 2	Cruise : SAMBA1
Date : 19-02-94	Ship : SUROIT
Bottom depth: 4500 m	Institute: IFREMER
Position : S 22 29.70 W 32 50.20	

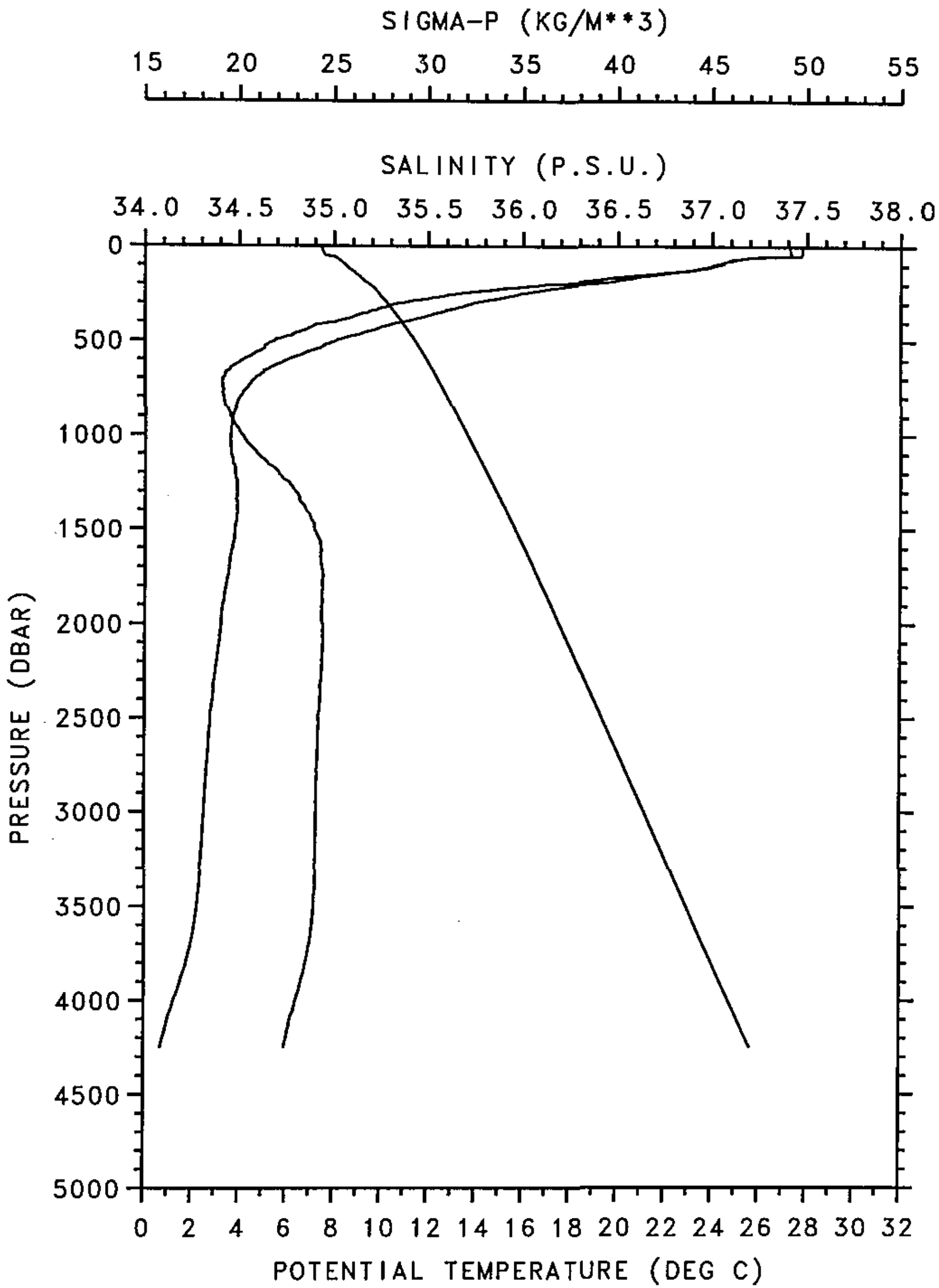
PRESSURE	TEMPERATURE	SALINITY	POTENTIAL TEMP.	SIGMAP	SOUND SPEED	SIGMA0	SIGMA1	DYNAMIC HEIGHT
dbar	deg.C	p.s.u.	deg.C	kg/m**3	m/s	kg/m**3	kg/m**3	dyn.m.
10.0	28.412	37.023	28.410	23.823	1544.517	23.781	27.928	2.713
20.0	28.323	37.020	28.318	23.893	1544.489	23.809	27.958	2.672
30.0	28.282	37.016	28.275	23.947	1544.564	23.821	27.969	2.632
40.0	25.747	36.858	25.738	24.687	1538.838	24.518	28.698	2.593
50.0	24.359	36.732	24.348	25.061	1535.549	24.849	29.048	2.561
60.0	23.668	36.716	23.655	25.299	1533.995	25.044	29.252	2.531
70.0	23.074	36.693	23.060	25.499	1532.646	25.201	29.418	2.502
80.0	22.689	36.680	22.673	25.644	1531.819	25.303	29.525	2.475
90.0	22.274	36.654	22.256	25.787	1530.889	25.403	29.631	2.448
100.0	21.930	36.609	21.910	25.894	1530.112	25.466	29.700	2.423
150.0	19.648	36.205	19.620	26.428	1524.334	25.781	30.052	2.302
200.0	17.796	35.893	17.762	26.883	1519.520	26.015	30.317	2.195
250.0	15.675	35.544	15.636	27.344	1513.551	26.249	30.590	2.097
300.0	14.136	35.312	14.092	27.730	1509.236	26.409	30.779	2.008
350.0	12.851	35.140	12.803	28.091	1505.638	26.541	30.937	1.926
400.0	11.703	35.004	11.651	28.438	1502.409	26.658	31.079	1.849
450.0	10.549	34.874	10.494	28.781	1499.047	26.768	31.213	1.778
500.0	9.378	34.740	9.322	29.111	1495.494	26.862	31.334	1.712
550.0	8.424	34.639	8.366	29.419	1492.668	26.935	31.428	1.649
600.0	7.159	34.530	7.101	29.761	1488.547	27.035	31.558	1.591
650.0	6.065	34.445	6.007	30.083	1484.980	27.113	31.664	1.537
700.0	5.291	34.386	5.233	30.371	1482.627	27.161	31.732	1.487
750.0	4.741	34.359	4.682	30.651	1481.177	27.203	31.787	1.439
800.0	4.456	34.377	4.394	30.931	1480.852	27.249	31.841	1.393
850.0	4.144	34.384	4.080	31.204	1480.393	27.288	31.888	1.349
900.0	3.965	34.401	3.898	31.469	1480.495	27.320	31.924	1.307
950.0	3.744	34.428	3.674	31.746	1480.431	27.364	31.974	1.267
1000.0	3.620	34.456	3.547	32.012	1480.773	27.399	32.012	1.228
1100.0	3.528	34.531	3.448	32.539	1482.141	27.468	32.084	1.155
1200.0	3.631	34.620	3.542	33.052	1484.352	27.530	32.142	1.088
1300.0	3.896	34.749	3.795	33.573	1487.295	27.608	32.212	1.026
1400.0	3.981	34.826	3.870	34.075	1489.416	27.661	32.263	0.968
1500.0	3.990	34.881	3.870	34.568	1491.192	27.705	32.306	0.913
1600.0	3.756	34.895	3.630	35.063	1491.901	27.741	32.348	0.862
1700.0	3.718	34.919	3.583	35.537	1493.444	27.764	32.373	0.813
1800.0	3.679	34.942	3.535	36.010	1494.985	27.788	32.397	0.765
1900.0	3.591	34.947	3.439	36.475	1496.298	27.801	32.413	0.719
2000.0	3.434	34.937	3.275	36.938	1497.302	27.809	32.425	0.673
2100.0	3.354	34.937	3.187	37.397	1498.645	27.817	32.436	0.627
2200.0	3.291	34.939	3.115	37.855	1500.064	27.826	32.446	0.582
2300.0	3.217	34.936	3.033	38.309	1501.432	27.831	32.454	0.537
2400.0	3.146	34.931	2.953	38.761	1502.812	27.834	32.460	0.493
2500.0	3.083	34.928	2.882	39.212	1504.231	27.839	32.466	0.448
2600.0	3.009	34.924	2.799	39.664	1505.604	27.843	32.472	0.403
2700.0	2.946	34.920	2.727	40.113	1507.026	27.846	32.477	0.358
2800.0	2.891	34.917	2.663	40.561	1508.484	27.849	32.483	0.313
2900.0	2.838	34.914	2.601	41.008	1509.954	27.852	32.487	0.269
3000.0	2.786	34.911	2.540	41.455	1511.430	27.855	32.492	0.224
3100.0	2.744	34.909	2.489	41.899	1512.952	27.858	32.496	0.179
3200.0	2.697	34.906	2.432	42.343	1514.453	27.861	32.500	0.134
3300.0	2.641	34.903	2.367	42.788	1515.918	27.864	32.505	0.089
3400.0	2.560	34.896	2.277	43.233	1517.274	27.866	32.510	0.044
3500.0	2.484	34.890	2.192	43.677	1518.654	27.868	32.514	0.000
3600.0	2.360	34.878	2.060	44.125	1519.822	27.869	32.519	-0.044
3700.0	2.193	34.861	1.887	44.575	1520.801	27.869	32.524	-0.087
3800.0	1.976	34.839	1.665	45.030	1521.559	27.869	32.530	-0.129
3900.0	1.766	34.816	1.450	45.483	1522.344	27.866	32.534	-0.170
4000.0	1.508	34.789	1.188	45.941	1522.915	27.863	32.539	-0.209
4100.0	1.337	34.770	1.011	46.389	1523.873	27.860	32.541	-0.246
4200.0	1.240	34.759	0.906	46.830	1525.167	27.858	32.542	-0.282
4270.0	1.127	34.746	0.789	47.142	1525.869	27.855	32.542	-0.307

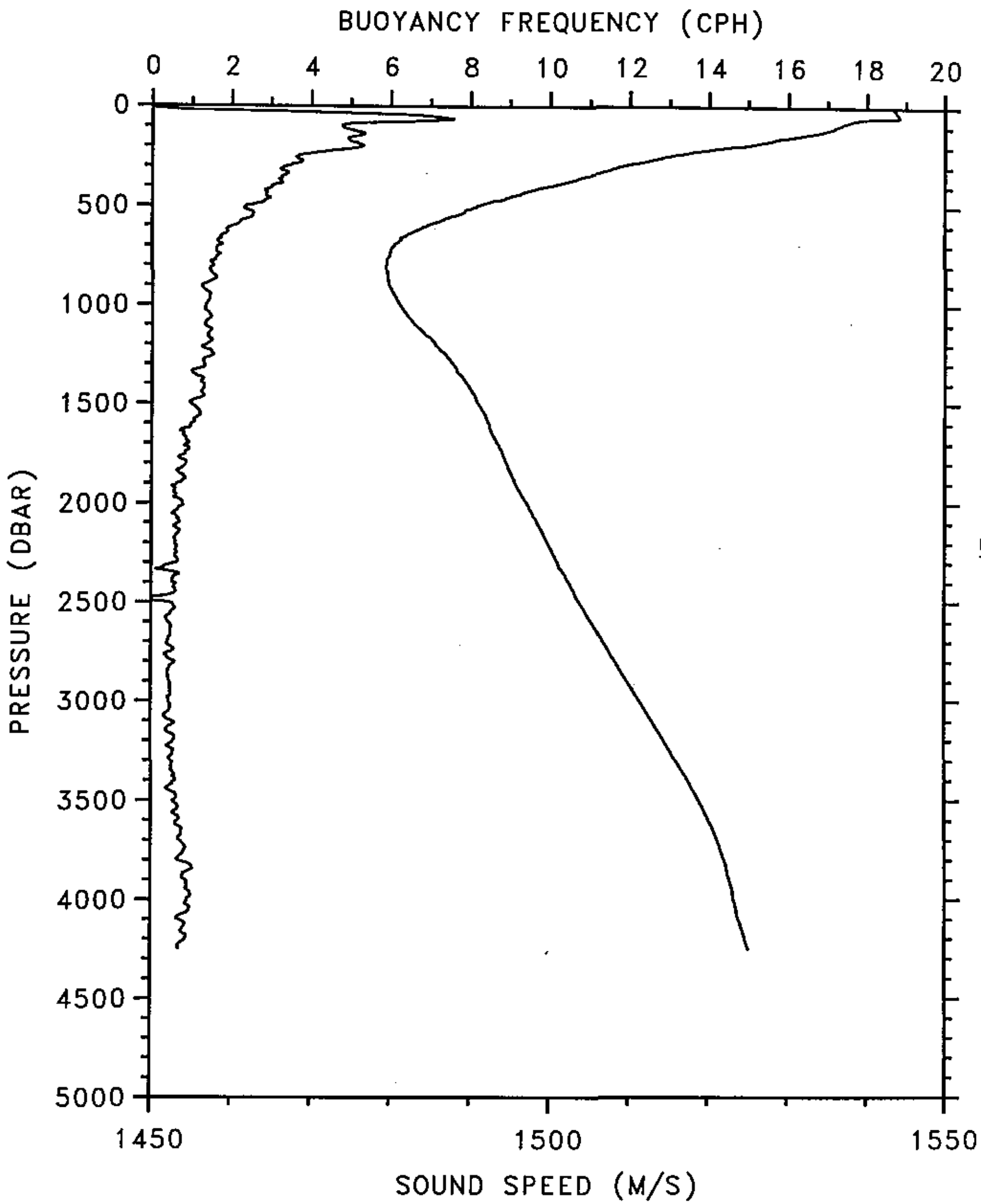


samba10002.ecp

Station : 3	Cruise : SAMBA1
Date : 21-02-94	Ship : SUROIT
Bottom depth: 4425 m	Institute: IFREMER
Position : S 18 30.00 W 31 20.00	

PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	27.794	37.410	27.792	24.319	1543.576	24.277	28.429	2.643
20.0	27.796	37.412	27.791	24.362	1543.751	24.278	28.430	2.607
30.0	27.798	37.415	27.791	24.407	1543.927	24.281	28.433	2.570
40.0	27.794	37.417	27.785	24.452	1544.088	24.284	28.437	2.534
50.0	27.654	37.406	27.642	24.533	1543.936	24.323	28.477	2.497
60.0	25.497	37.182	25.484	25.096	1538.934	24.842	29.024	2.464
70.0	25.042	37.104	25.027	25.220	1537.937	24.924	29.112	2.434
80.0	24.633	37.077	24.616	25.368	1537.091	25.029	29.223	2.403
90.0	24.395	37.061	24.376	25.471	1536.663	25.090	29.286	2.374
100.0	24.029	37.019	24.008	25.593	1535.889	25.168	29.370	2.346
150.0	21.651	36.637	21.621	26.210	1530.245	25.569	29.806	2.212
200.0	18.673	36.128	18.638	26.841	1522.327	25.976	30.263	2.097
250.0	15.890	35.653	15.850	27.378	1514.343	26.284	30.621	2.000
300.0	13.919	35.347	13.876	27.804	1508.574	26.482	30.856	1.914
350.0	12.487	35.179	12.440	28.195	1504.463	26.643	31.046	1.835
400.0	10.889	35.003	10.840	28.594	1499.577	26.807	31.244	1.764
450.0	9.477	34.824	9.426	28.934	1495.133	26.911	31.380	1.700
500.0	8.132	34.684	8.080	29.276	1490.802	27.014	31.513	1.641
550.0	7.162	34.619	7.109	29.604	1487.846	27.104	31.626	1.586
600.0	6.130	34.523	6.077	29.907	1484.512	27.166	31.714	1.536
650.0	5.295	34.452	5.241	30.195	1481.903	27.213	31.782	1.488
700.0	4.733	34.409	4.678	30.463	1480.383	27.243	31.827	1.443
750.0	4.415	34.410	4.357	30.733	1479.899	27.279	31.871	1.399
800.0	4.107	34.418	4.047	31.007	1479.457	27.318	31.919	1.357
850.0	3.925	34.431	3.862	31.269	1479.540	27.348	31.953	1.316
900.0	3.772	34.449	3.706	31.531	1479.748	27.378	31.987	1.277
950.0	3.716	34.476	3.647	31.787	1480.375	27.405	32.016	1.239
1000.0	3.680	34.513	3.607	32.050	1481.100	27.439	32.050	1.203
1100.0	3.717	34.593	3.635	32.564	1483.018	27.499	32.109	1.133
1200.0	3.891	34.706	3.799	33.086	1485.556	27.573	32.178	1.068
1300.0	4.001	34.796	3.899	33.596	1487.795	27.634	32.236	1.008
1400.0	4.008	34.853	3.897	34.092	1489.564	27.680	32.281	0.952
1500.0	3.923	34.897	3.804	34.590	1490.933	27.725	32.327	0.899
1600.0	3.845	34.931	3.718	35.078	1492.321	27.760	32.365	0.850
1700.0	3.698	34.934	3.563	35.552	1493.380	27.778	32.387	0.802
1800.0	3.594	34.939	3.451	36.020	1494.624	27.793	32.405	0.756
1900.0	3.447	34.937	3.297	36.488	1495.678	27.807	32.423	0.711
2000.0	3.398	34.940	3.240	36.946	1497.154	27.815	32.432	0.666
2100.0	3.308	34.941	3.141	37.407	1498.455	27.825	32.445	0.621
2200.0	3.221	34.937	3.046	37.864	1499.765	27.831	32.453	0.577
2300.0	3.125	34.932	2.942	38.320	1501.037	27.836	32.462	0.533
2400.0	3.063	34.927	2.872	38.770	1502.455	27.839	32.466	0.489
2500.0	2.976	34.918	2.777	39.221	1503.763	27.840	32.470	0.445
2600.0	2.936	34.917	2.727	39.670	1505.284	27.844	32.475	0.401
2700.0	2.888	34.915	2.670	40.118	1506.772	27.847	32.480	0.357
2800.0	2.839	34.913	2.612	40.566	1508.258	27.851	32.485	0.312
2900.0	2.799	34.909	2.563	41.011	1509.781	27.852	32.488	0.268
3000.0	2.766	34.909	2.520	41.456	1511.342	27.855	32.493	0.223
3100.0	2.735	34.908	2.480	41.900	1512.912	27.858	32.496	0.179
3200.0	2.692	34.908	2.427	42.345	1514.434	27.863	32.502	0.134
3300.0	2.635	34.903	2.361	42.789	1515.893	27.864	32.506	0.089
3400.0	2.586	34.901	2.302	43.232	1517.391	27.868	32.511	0.045
3500.0	2.515	34.895	2.222	43.676	1518.792	27.870	32.515	0.000
3600.0	2.412	34.887	2.111	44.123	1520.057	27.872	32.521	-0.044
3700.0	2.271	34.874	1.963	44.572	1521.153	27.874	32.527	-0.088
3800.0	2.091	34.854	1.777	45.022	1522.074	27.872	32.530	-0.130
3900.0	1.846	34.829	1.527	45.479	1522.708	27.871	32.536	-0.171
4000.0	1.575	34.803	1.253	45.940	1523.225	27.870	32.543	-0.211
4100.0	1.327	34.773	1.002	46.393	1523.834	27.863	32.544	-0.248
4200.0	1.129	34.754	0.799	46.846	1524.674	27.861	32.548	-0.284
4251.0	1.038	34.741	0.705	47.072	1525.142	27.856	32.546	-0.301





samba10003.ecp

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|                                                     |
| Station      :   4       Cruise    : SAMBA1         |
|                                                     |
| Date         : 22-02-94 Ship       : SUROIT         |
|                                                     |
| Bottom depth: 4855 m    Institute: IFREMER          |
|                                                     |
| Position     : S 14 14.50                           |
|                W 31  0.00                           |
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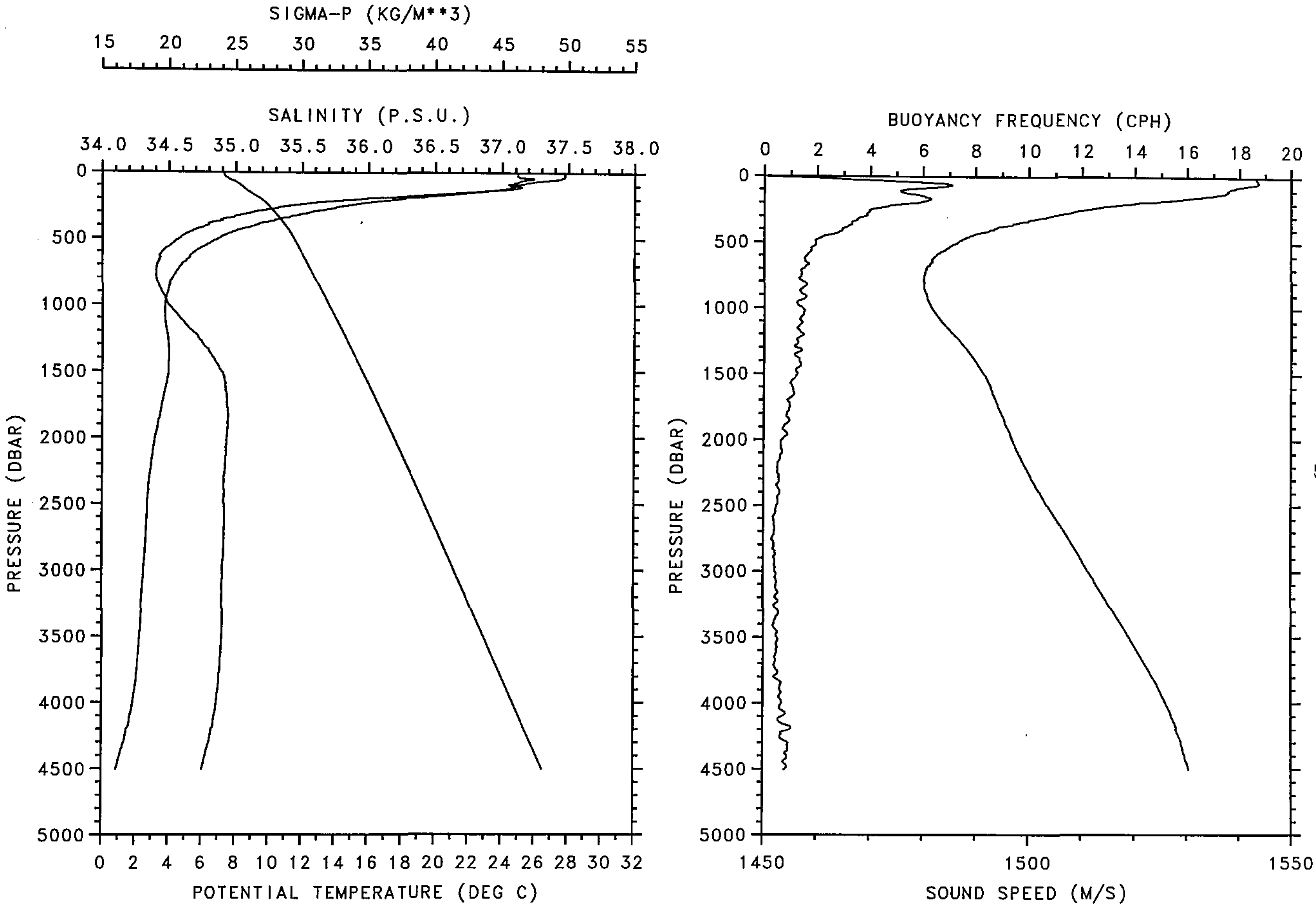
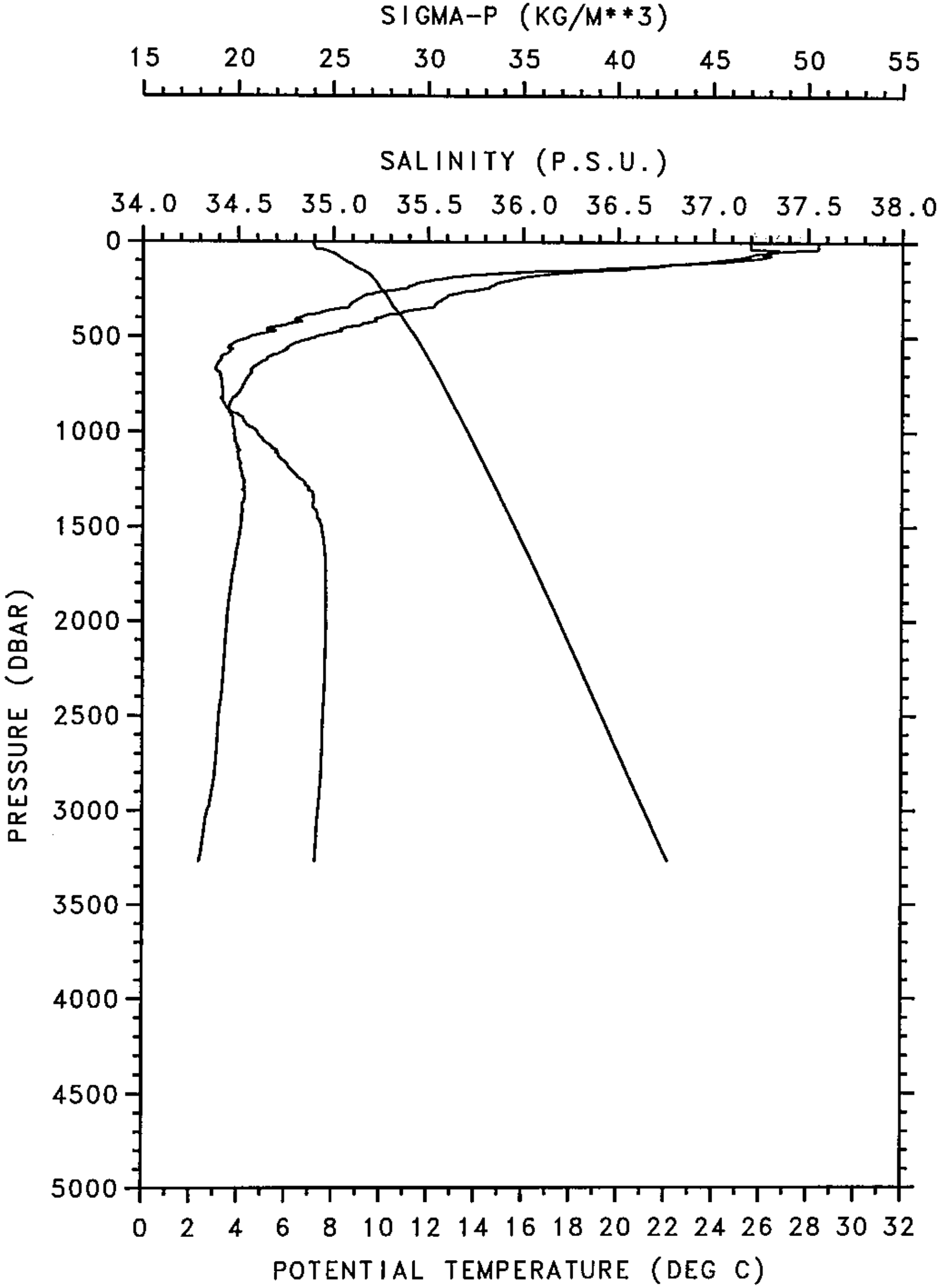
PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	27.770	37.115	27.768	24.104	1543.211	24.062	28.216	2.656
20.0	27.775	37.115	27.770	24.146	1543.390	24.062	28.216	2.618
30.0	27.776	37.117	27.769	24.190	1543.563	24.064	28.218	2.579
40.0	27.708	37.171	27.699	24.295	1543.638	24.127	28.282	2.541
50.0	27.482	37.236	27.470	24.461	1543.374	24.251	28.408	2.504
60.0	26.671	37.149	26.657	24.700	1541.622	24.447	28.615	2.467
70.0	25.928	37.126	25.912	24.961	1540.052	24.666	28.842	2.433
80.0	25.447	37.099	25.429	25.134	1539.062	24.796	28.979	2.401
90.0	25.029	37.044	25.009	25.265	1538.176	24.884	29.073	2.370
100.0	24.726	37.059	24.704	25.412	1537.632	24.989	29.181	2.339
150.0	22.286	36.723	22.256	26.095	1531.999	25.455	29.683	2.198
200.0	17.847	35.932	17.813	26.900	1519.714	26.032	30.333	2.083
250.0	14.715	35.415	14.677	27.462	1510.385	26.363	30.722	1.989
300.0	12.500	35.126	12.460	27.929	1503.617	26.598	31.001	1.909
350.0	10.640	34.912	10.597	28.346	1497.764	26.779	31.222	1.837
400.0	9.236	34.790	9.191	28.724	1493.386	26.923	31.397	1.774
450.0	7.848	34.660	7.802	29.077	1488.874	27.036	31.542	1.717
500.0	7.030	34.578	6.982	29.365	1486.459	27.089	31.615	1.663
550.0	6.306	34.514	6.256	29.648	1484.372	27.136	31.680	1.612
600.0	5.624	34.452	5.573	29.922	1482.404	27.173	31.734	1.563
650.0	5.233	34.433	5.179	30.188	1481.628	27.205	31.776	1.515
700.0	4.794	34.411	4.738	30.457	1480.635	27.238	31.821	1.470
750.0	4.508	34.403	4.450	30.716	1480.274	27.264	31.854	1.425
800.0	4.288	34.407	4.227	30.976	1480.195	27.291	31.886	1.382
850.0	4.074	34.421	4.010	31.242	1480.149	27.325	31.926	1.340
900.0	3.982	34.442	3.915	31.499	1480.619	27.351	31.955	1.299
950.0	3.866	34.469	3.796	31.763	1480.996	27.385	31.991	1.260
1000.0	3.811	34.492	3.737	32.017	1481.624	27.409	32.017	1.222
1100.0	3.830	34.578	3.747	32.538	1483.473	27.476	32.083	1.150
1200.0	3.951	34.673	3.859	33.052	1485.764	27.541	32.144	1.082
1300.0	4.077	34.760	3.974	33.557	1488.065	27.598	32.197	1.019
1400.0	4.117	34.833	4.005	34.061	1489.992	27.653	32.251	0.960
1500.0	4.076	34.893	3.955	34.565	1491.566	27.706	32.305	0.905
1600.0	3.966	34.922	3.837	35.054	1492.814	27.741	32.343	0.853
1700.0	3.798	34.934	3.662	35.538	1493.799	27.768	32.375	0.804
1800.0	3.649	34.942	3.506	36.014	1494.859	27.790	32.401	0.756
1900.0	3.492	34.941	3.341	36.485	1495.873	27.806	32.420	0.710
2000.0	3.338	34.935	3.180	36.951	1496.893	27.816	32.435	0.665
2100.0	3.211	34.927	3.046	37.411	1498.026	27.823	32.445	0.621
2200.0	3.129	34.923	2.956	37.866	1499.356	27.828	32.453	0.577
2300.0	3.015	34.912	2.834	38.321	1500.543	27.830	32.459	0.533
2400.0	2.989	34.917	2.799	38.774	1502.127	27.837	32.467	0.490
2500.0	2.930	34.915	2.731	39.226	1503.563	27.842	32.473	0.446
2600.0	2.913	34.918	2.705	39.674	1505.188	27.846	32.478	0.402
2700.0	2.880	34.916	2.663	40.120	1506.739	27.849	32.482	0.358
2800.0	2.859	34.915	2.632	40.565	1508.346	27.851	32.485	0.314
2900.0	2.819	34.912	2.583	41.010	1509.870	27.852	32.488	0.270
3000.0	2.763	34.905	2.518	41.454	1511.324	27.853	32.490	0.225
3100.0	2.711	34.901	2.456	41.898	1512.801	27.855	32.494	0.180
3200.0	2.681	34.902	2.416	42.343	1514.380	27.859	32.499	0.135
3300.0	2.653	34.903	2.378	42.786	1515.969	27.863	32.504	0.090
3400.0	2.613	34.902	2.329	43.229	1517.507	27.866	32.509	0.045
3500.0	2.574	34.899	2.280	43.669	1519.049	27.868	32.512	0.000
3600.0	2.515	34.894	2.211	44.110	1520.505	27.870	32.515	-0.045
3700.0	2.464	34.889	2.151	44.550	1521.998	27.871	32.518	-0.090
3800.0	2.398	34.880	2.075	44.988	1523.423	27.870	32.519	-0.135
3900.0	2.317	34.874	1.985	45.431	1524.790	27.872	32.524	-0.180
4000.0	2.202	34.861	1.862	45.873	1526.004	27.871	32.527	-0.224
4100.0	2.046	34.844	1.699	46.320	1527.039	27.870	32.531	-0.268
4200.0	1.848	34.823	1.496	46.771	1527.889	27.868	32.535	-0.311
4300.0	1.708	34.806	1.349	47.214	1528.994	27.865	32.536	-0.352
4400.0	1.467	34.781	1.104	47.668	1529.653	27.862	32.540	-0.392
4500.0	1.248	34.757	0.880	48.120	1530.407	27.858	32.543	-0.430
4506.0	1.238	34.756	0.870	48.146	1530.466	27.858	32.543	-0.432

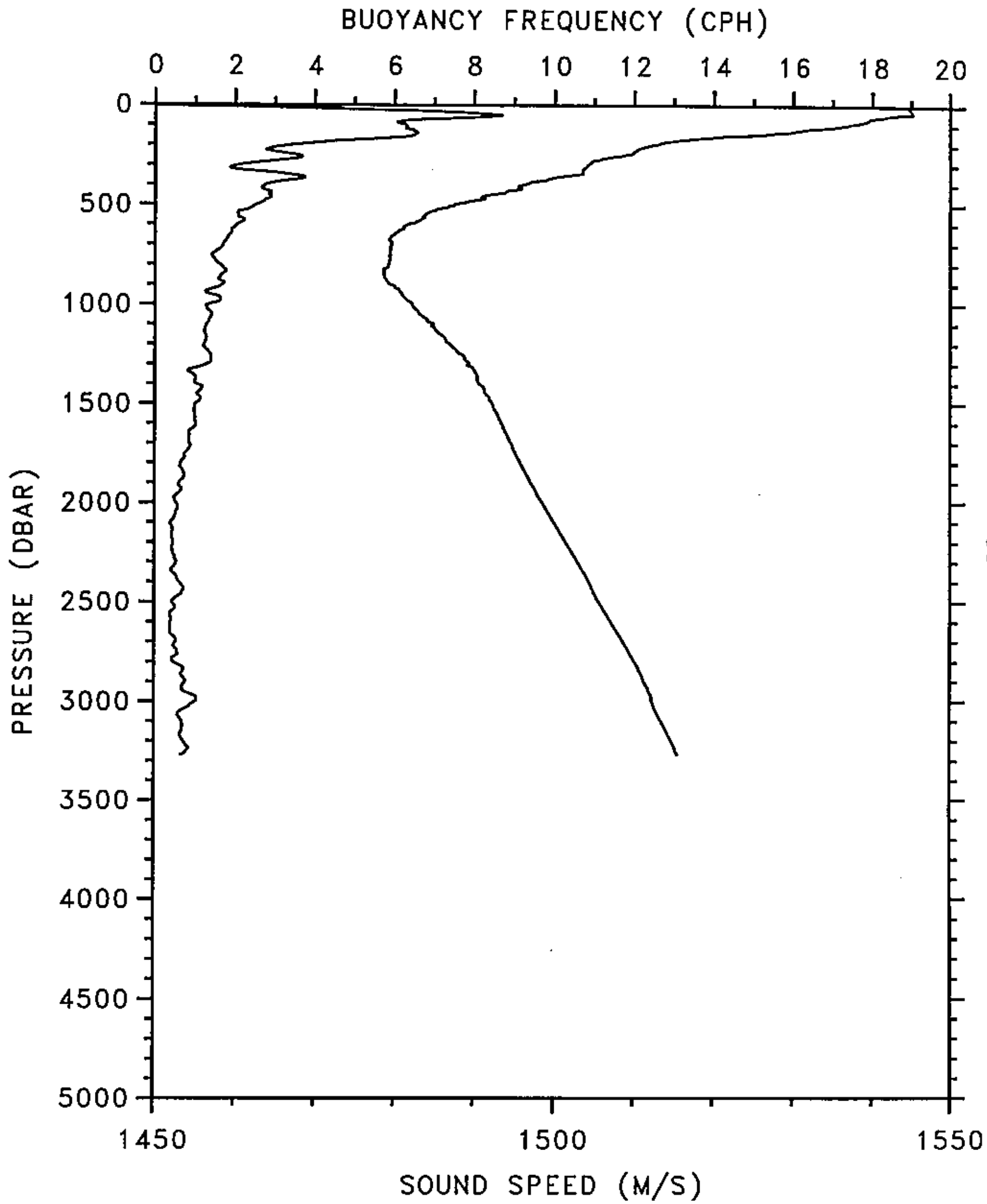


samba10004.ecp

Station : 5	Cruise : SAMBA1
Date : 24-02-94	Ship : SUROIT
Bottom depth: 3460 m	Institute: IFREMER
Position : S 13 16.30 W 37 34.90	

PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	28.446	37.197	28.444	23.943	1544.774	23.901	28.047	1.577
20.0	28.448	37.197	28.443	23.985	1544.947	23.901	28.047	1.537
30.0	28.448	37.198	28.441	24.028	1545.116	23.903	28.048	1.497
40.0	27.756	37.346	27.747	24.411	1543.929	24.243	28.396	1.457
50.0	26.700	37.304	26.689	24.765	1541.686	24.554	28.720	1.422
60.0	25.933	37.261	25.920	25.019	1540.041	24.766	28.941	1.389
70.0	25.625	37.308	25.609	25.194	1539.538	24.898	29.077	1.357
80.0	25.264	37.271	25.246	25.321	1538.813	24.983	29.167	1.327
90.0	24.583	37.161	24.564	25.490	1537.229	25.109	29.302	1.298
100.0	24.050	37.087	24.029	25.638	1536.014	25.214	29.415	1.269
150.0	19.111	36.185	19.084	26.554	1522.805	25.906	30.184	1.145
200.0	15.492	35.534	15.461	27.158	1512.142	26.281	30.625	1.049
250.0	14.210	35.341	14.173	27.515	1508.681	26.414	30.783	0.961
300.0	12.671	35.131	12.630	27.899	1504.198	26.568	30.968	0.882
350.0	11.901	35.038	11.855	28.203	1502.303	26.646	31.062	0.806
400.0	9.963	34.822	9.916	28.622	1496.065	26.827	31.285	0.737
450.0	8.609	34.682	8.561	28.971	1491.762	26.938	31.427	0.674
500.0	7.304	34.560	7.255	29.309	1487.495	27.036	31.556	0.617
550.0	6.192	34.454	6.143	29.617	1483.846	27.103	31.650	0.564
600.0	5.465	34.421	5.415	29.919	1481.725	27.167	31.733	0.514
650.0	4.841	34.389	4.789	30.205	1479.975	27.215	31.796	0.467
700.0	4.559	34.406	4.505	30.483	1479.663	27.260	31.848	0.422
750.0	4.312	34.416	4.255	30.751	1479.480	27.295	31.890	0.379
800.0	4.061	34.420	4.001	31.014	1479.267	27.325	31.926	0.337
850.0	3.727	34.427	3.666	31.290	1478.704	27.364	31.975	0.297
900.0	3.713	34.472	3.648	31.556	1479.530	27.402	32.012	0.259
950.0	3.825	34.535	3.755	31.820	1480.910	27.441	32.048	0.223
1000.0	3.924	34.599	3.849	32.087	1482.236	27.483	32.087	0.188
1050.0	3.938	34.635	3.858	32.341	1483.171	27.510	32.114	0.154
1100.0	4.133	34.702	4.047	32.596	1484.900	27.544	32.142	0.121
1150.0	4.130	34.736	4.040	32.851	1485.762	27.572	32.170	0.089
1200.0	4.207	34.778	4.112	33.100	1486.967	27.598	32.194	0.059
1250.0	4.339	34.833	4.238	33.352	1488.416	27.628	32.220	0.029
1300.0	4.347	34.873	4.242	33.609	1489.333	27.660	32.251	0.000
1350.0	4.376	34.896	4.266	33.848	1490.315	27.675	32.266	-0.028
1400.0	4.269	34.897	4.155	34.090	1490.706	27.688	32.282	-0.055
1450.0	4.255	34.919	4.137	34.335	1491.509	27.707	32.301	-0.082
1500.0	4.235	34.940	4.112	34.580	1492.287	27.727	32.321	-0.109
1550.0	4.177	34.947	4.050	34.819	1492.890	27.739	32.335	-0.134
1600.0	4.112	34.955	3.981	35.059	1493.465	27.752	32.350	-0.160
1650.0	4.040	34.959	3.906	35.297	1494.006	27.763	32.363	-0.185
1700.0	3.988	34.962	3.849	35.532	1494.630	27.772	32.373	-0.209
1750.0	3.914	34.962	3.772	35.767	1495.157	27.780	32.383	-0.233
1800.0	3.864	34.963	3.718	36.000	1495.787	27.786	32.390	-0.258
1850.0	3.824	34.964	3.673	36.230	1496.459	27.791	32.397	-0.282
1900.0	3.776	34.964	3.621	36.461	1497.096	27.796	32.404	-0.305
1950.0	3.736	34.964	3.577	36.691	1497.767	27.801	32.409	-0.329
2000.0	3.720	34.963	3.557	36.916	1498.538	27.802	32.411	-0.353
2100.0	3.665	34.963	3.493	37.371	1499.988	27.808	32.419	-0.400
2200.0	3.624	34.960	3.443	37.821	1501.494	27.811	32.423	-0.448
2300.0	3.577	34.957	3.387	38.270	1502.978	27.814	32.427	-0.497
2400.0	3.517	34.954	3.318	38.721	1504.409	27.818	32.434	-0.545
2500.0	3.417	34.949	3.209	39.176	1505.671	27.825	32.443	-0.593
2600.0	3.372	34.945	3.155	39.623	1507.167	27.827	32.446	-0.642
2700.0	3.332	34.943	3.106	40.069	1508.689	27.830	32.451	-0.691
2800.0	3.274	34.939	3.038	40.517	1510.135	27.833	32.456	-0.739
2900.0	3.154	34.930	2.910	40.969	1511.315	27.838	32.464	-0.788
3000.0	2.990	34.924	2.740	41.431	1512.313	27.848	32.479	-0.836
3100.0	2.869	34.917	2.611	41.885	1513.494	27.854	32.489	-0.882
3200.0	2.764	34.912	2.497	42.337	1514.746	27.860	32.498	-0.928
3270.0	2.669	34.907	2.397	42.655	1515.530	27.864	32.505	-0.960

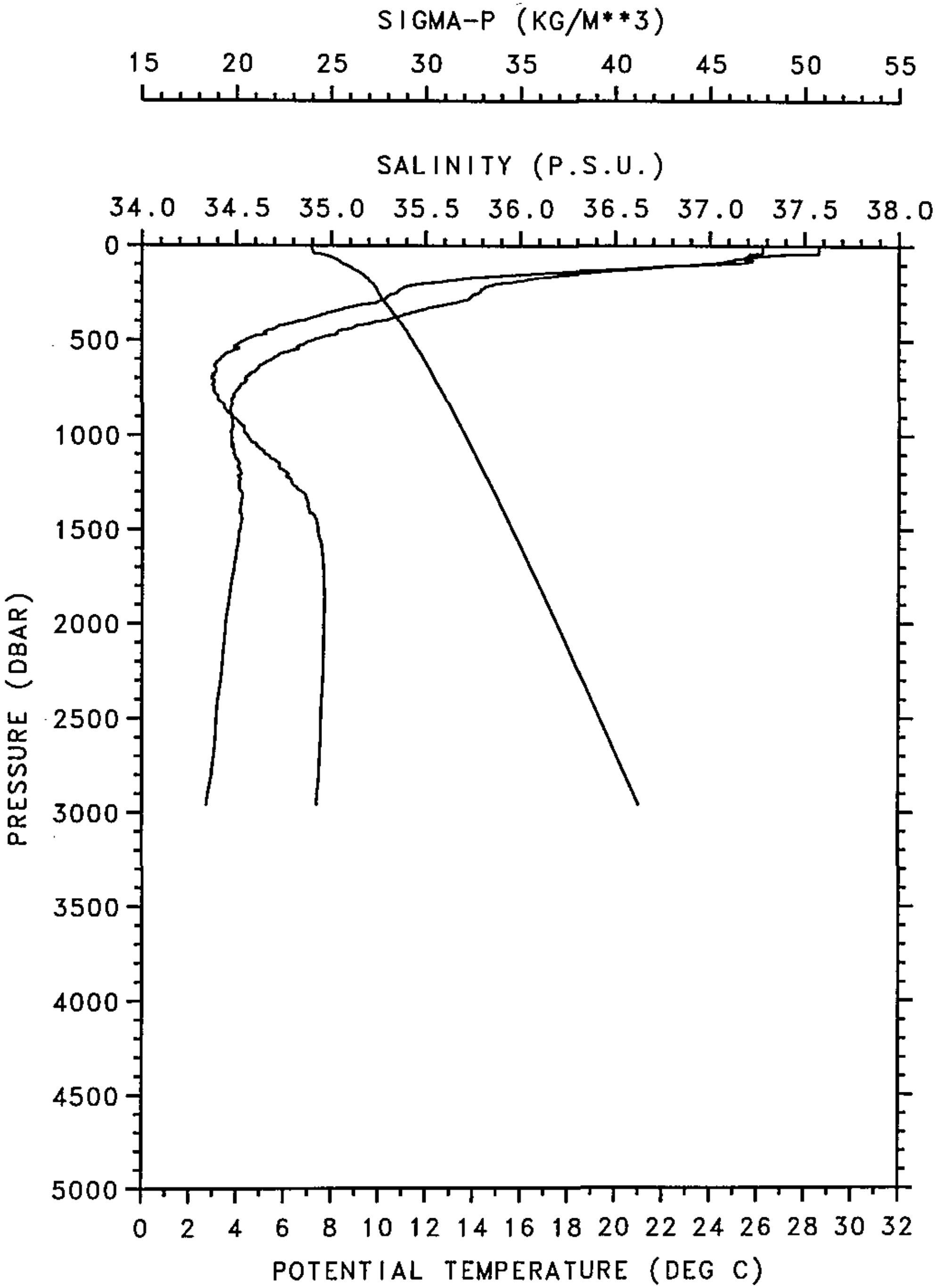


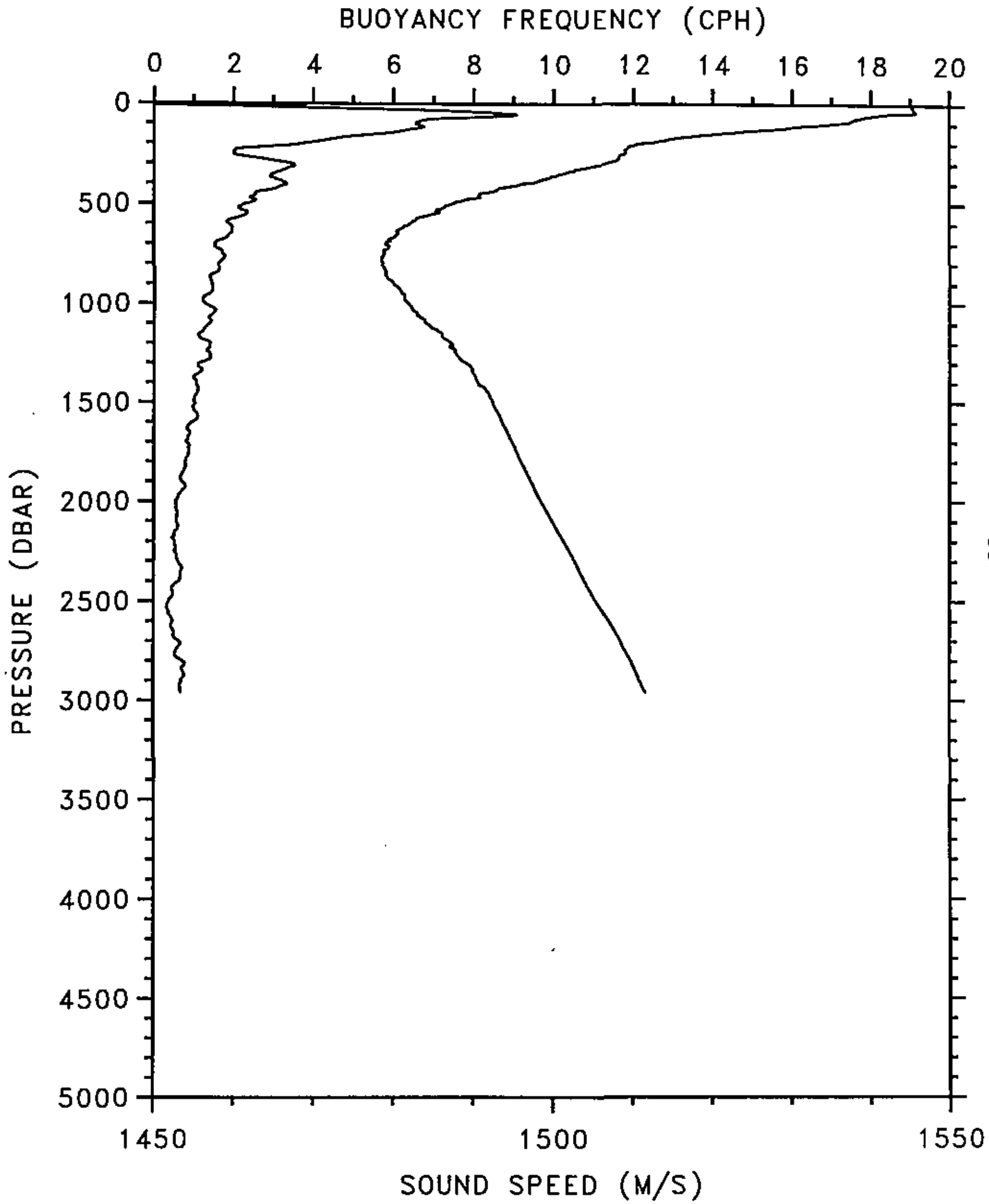


samba10005.ecp

Station : 6	Cruise : SAMBA1
Date : 24-02-94	Ship : SUROIT
Bottom depth: 3190 m	Institute: IFREMER
Position : S 13 14.50 W 37 45.50	

PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	28.625	37.276	28.623	23.943	1545.243	23.901	28.044	1.581
20.0	28.625	37.276	28.620	23.985	1545.411	23.902	28.045	1.541
30.0	28.628	37.276	28.621	24.027	1545.586	23.901	28.045	1.501
40.0	28.632	37.276	28.622	24.068	1545.763	23.901	28.044	1.460
50.0	26.674	37.202	26.663	24.696	1541.517	24.486	28.652	1.424
60.0	25.835	37.188	25.822	24.994	1539.734	24.741	28.918	1.391
70.0	25.206	37.185	25.191	25.231	1538.415	24.935	29.120	1.359
80.0	24.771	37.198	24.754	25.418	1537.555	25.079	29.270	1.329
90.0	24.527	37.183	24.508	25.524	1537.116	25.142	29.337	1.301
100.0	23.433	36.979	23.412	25.740	1534.365	25.315	29.525	1.273
150.0	18.421	36.054	18.395	26.631	1520.688	25.981	30.272	1.155
200.0	15.151	35.489	15.120	27.200	1511.022	26.322	30.673	1.060
250.0	14.280	35.344	14.243	27.503	1508.910	26.401	30.769	0.974
300.0	13.325	35.241	13.283	27.849	1506.504	26.522	30.909	0.891
350.0	11.570	35.003	11.525	28.241	1501.123	26.681	31.104	0.816
400.0	9.959	34.822	9.912	28.623	1496.051	26.828	31.286	0.746
450.0	8.345	34.658	8.298	28.995	1490.746	26.960	31.455	0.684
500.0	7.277	34.547	7.228	29.303	1487.374	27.030	31.550	0.627
550.0	6.521	34.501	6.471	29.606	1485.202	27.097	31.636	0.574
600.0	5.552	34.414	5.501	29.902	1482.067	27.151	31.715	0.523
650.0	4.968	34.395	4.916	30.193	1480.501	27.205	31.783	0.475
700.0	4.425	34.370	4.371	30.471	1479.064	27.246	31.838	0.430
750.0	4.175	34.380	4.119	30.739	1478.865	27.281	31.879	0.386
800.0	3.949	34.404	3.890	31.015	1478.779	27.323	31.928	0.344
850.0	3.796	34.431	3.734	31.284	1478.999	27.361	31.969	0.304
900.0	3.827	34.479	3.761	31.547	1480.018	27.396	32.003	0.266
950.0	3.896	34.531	3.825	31.808	1481.203	27.431	32.036	0.229
1000.0	3.852	34.554	3.777	32.060	1481.876	27.454	32.060	0.193
1050.0	3.905	34.606	3.826	32.323	1482.995	27.491	32.095	0.158
1100.0	3.949	34.649	3.865	32.579	1484.064	27.521	32.124	0.124
1150.0	4.185	34.724	4.095	32.834	1485.975	27.557	32.153	0.092
1200.0	4.272	34.766	4.176	33.082	1487.221	27.581	32.176	0.060
1250.0	4.194	34.791	4.095	33.339	1487.761	27.610	32.206	0.029
1300.0	4.296	34.846	4.191	33.594	1489.087	27.644	32.237	0.000
1350.0	4.276	34.870	4.167	33.842	1489.867	27.665	32.259	-0.029
1400.0	4.237	34.880	4.124	34.081	1490.551	27.678	32.272	-0.057
1450.0	4.325	34.920	4.206	34.326	1491.801	27.701	32.293	-0.084
1500.0	4.251	34.928	4.128	34.568	1492.338	27.715	32.310	-0.111
1550.0	4.202	34.937	4.075	34.807	1492.981	27.728	32.324	-0.137
1600.0	4.138	34.949	4.007	35.051	1493.566	27.745	32.342	-0.163
1650.0	4.091	34.954	3.956	35.286	1494.212	27.754	32.353	-0.188
1700.0	4.031	34.957	3.892	35.522	1494.802	27.763	32.363	-0.213
1750.0	3.966	34.959	3.823	35.757	1495.370	27.772	32.374	-0.238
1800.0	3.902	34.959	3.755	35.991	1495.940	27.779	32.383	-0.262
1850.0	3.853	34.962	3.702	36.225	1496.577	27.787	32.392	-0.287
1900.0	3.803	34.962	3.648	36.456	1497.206	27.792	32.399	-0.311
1950.0	3.739	34.961	3.580	36.688	1497.776	27.798	32.406	-0.335
2000.0	3.697	34.959	3.534	36.917	1498.437	27.801	32.411	-0.359
2100.0	3.641	34.959	3.469	37.372	1499.882	27.808	32.419	-0.406
2200.0	3.573	34.957	3.393	37.826	1501.276	27.813	32.427	-0.454
2300.0	3.506	34.954	3.317	38.279	1502.676	27.818	32.434	-0.501
2400.0	3.395	34.947	3.198	38.735	1503.886	27.824	32.443	-0.549
2500.0	3.339	34.944	3.133	39.185	1505.335	27.828	32.448	-0.596
2600.0	3.311	34.942	3.095	39.630	1506.906	27.830	32.451	-0.644
2700.0	3.256	34.938	3.031	40.078	1508.362	27.833	32.456	-0.692
2800.0	3.176	34.934	2.942	40.529	1509.715	27.838	32.463	-0.740
2900.0	3.032	34.925	2.791	40.985	1510.792	27.844	32.474	-0.787
2961.0	2.976	34.923	2.730	41.261	1511.589	27.848	32.480	-0.815





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|                                                      |
| Station      :   7        Cruise    : SAMBA1         |
|                                                      |
| Date         : 24-02-94 Ship       : SUROIT          |
|                                                      |
| Bottom depth: 2830 m   Institute: IFREMER            |
|                                                      |
| Position     : S 13 12.70                            |
|                W 37 55.00                             |
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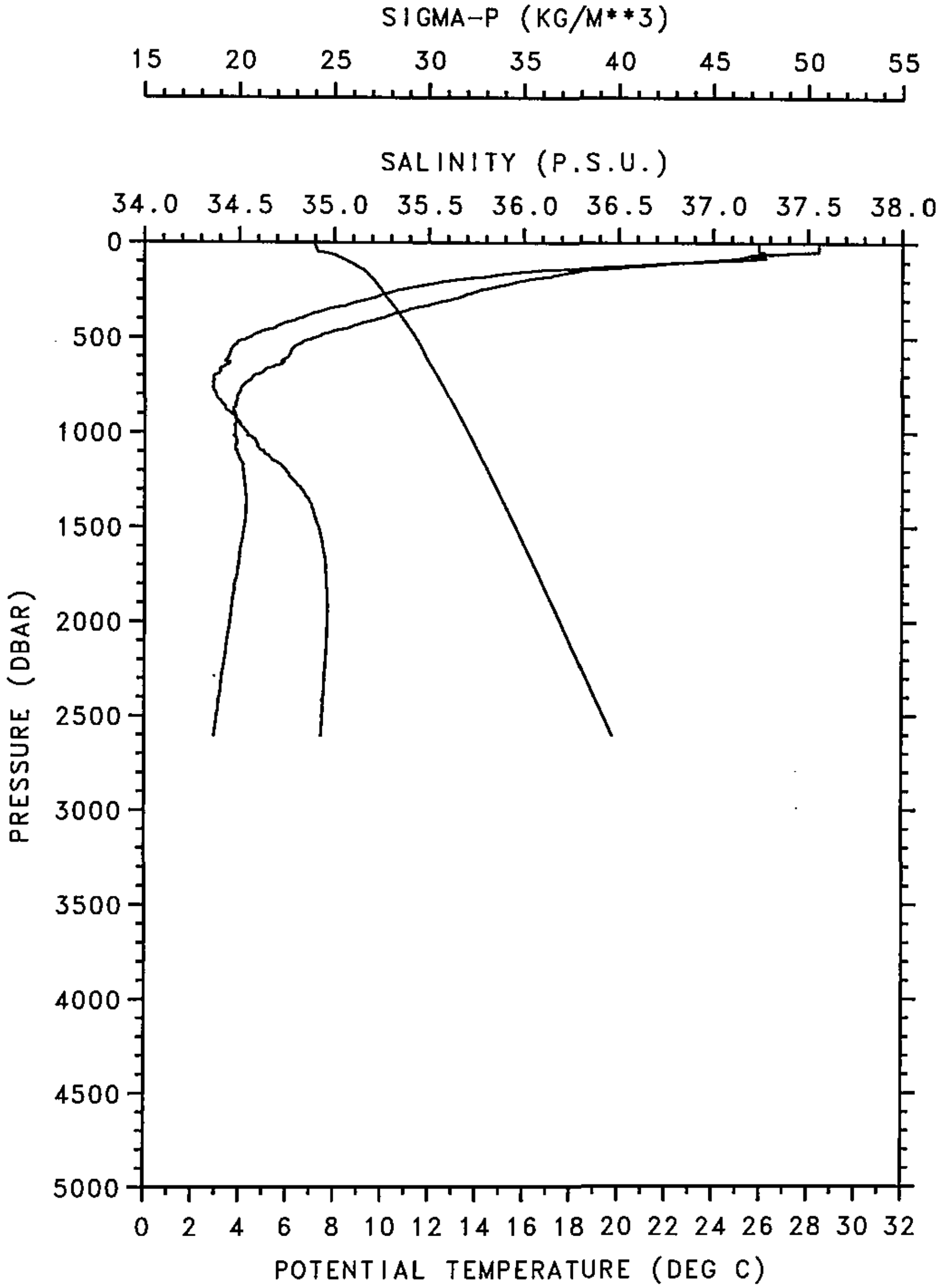
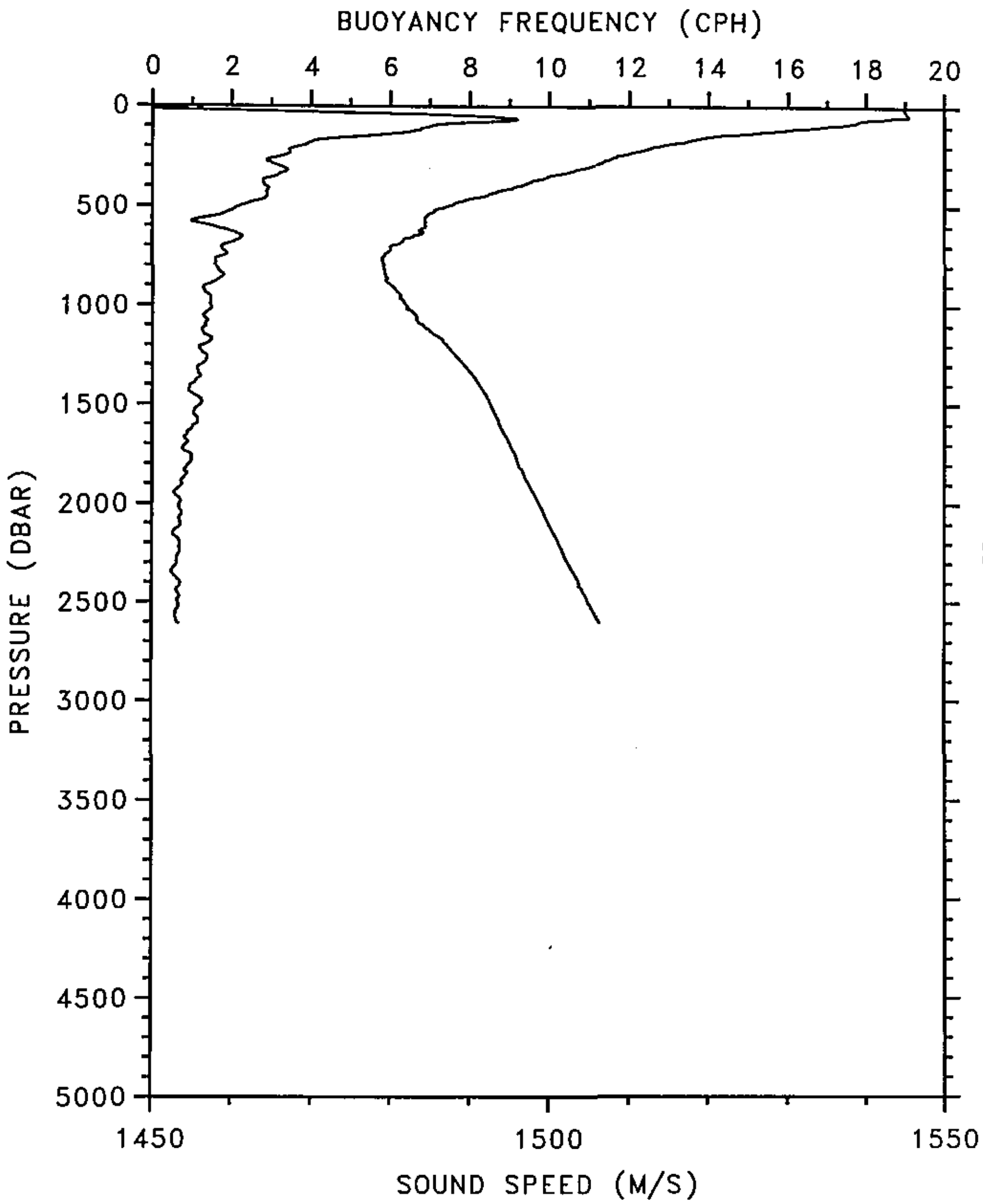
PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	28.465	37.239	28.463	23.968	1544.859	23.926	28.071	1.605
20.0	28.471	37.240	28.466	24.010	1545.042	23.926	28.071	1.565
30.0	28.475	37.240	28.468	24.051	1545.219	23.925	28.070	1.525
40.0	28.478	37.240	28.468	24.093	1545.394	23.925	28.070	1.485
50.0	27.873	37.270	27.861	24.358	1544.275	24.149	28.301	1.446
60.0	26.616	37.305	26.602	24.835	1541.663	24.583	28.750	1.410
70.0	25.459	37.213	25.443	25.174	1539.045	24.878	29.060	1.378
80.0	25.129	37.276	25.111	25.367	1538.498	25.028	29.214	1.347
90.0	24.349	37.153	24.330	25.555	1536.651	25.173	29.370	1.318
100.0	23.335	36.950	23.314	25.747	1534.087	25.322	29.533	1.291
150.0	18.282	36.020	18.256	26.640	1520.248	25.990	30.283	1.174
200.0	15.906	35.604	15.874	27.116	1513.506	26.241	30.577	1.076
250.0	14.132	35.329	14.095	27.523	1508.415	26.421	30.792	0.988
300.0	12.933	35.170	12.892	27.875	1505.120	26.546	30.941	0.907
350.0	11.210	34.960	11.166	28.276	1499.822	26.714	31.145	0.833
400.0	9.902	34.812	9.855	28.626	1495.833	26.830	31.289	0.765
450.0	8.609	34.688	8.561	28.976	1491.769	26.943	31.432	0.703
500.0	7.236	34.554	7.188	29.315	1487.225	27.041	31.563	0.646
550.0	6.354	34.468	6.304	29.605	1484.503	27.093	31.636	0.593
600.0	6.134	34.447	6.081	29.847	1484.432	27.105	31.654	0.541
650.0	5.564	34.424	5.509	30.136	1482.952	27.158	31.721	0.490
700.0	4.705	34.370	4.650	30.436	1480.218	27.215	31.800	0.443
750.0	4.278	34.367	4.221	30.716	1479.276	27.259	31.856	0.398
800.0	4.014	34.378	3.955	30.987	1479.017	27.296	31.899	0.354
850.0	3.869	34.408	3.807	31.257	1479.275	27.335	31.942	0.313
900.0	3.860	34.455	3.794	31.524	1480.125	27.374	31.980	0.274
950.0	3.919	34.501	3.848	31.782	1481.260	27.405	32.010	0.235
1000.0	3.888	34.537	3.813	32.043	1482.005	27.437	32.043	0.198
1050.0	3.957	34.586	3.877	32.300	1483.186	27.469	32.073	0.162
1100.0	3.971	34.627	3.887	32.559	1484.127	27.501	32.104	0.128
1150.0	4.147	34.687	4.057	32.810	1485.769	27.531	32.129	0.094
1200.0	4.247	34.745	4.152	33.069	1487.090	27.567	32.162	0.062
1250.0	4.291	34.782	4.191	33.319	1488.151	27.593	32.186	0.030
1300.0	4.345	34.826	4.240	33.572	1489.264	27.622	32.214	0.000
1350.0	4.389	34.861	4.279	33.819	1490.323	27.646	32.237	-0.030
1400.0	4.384	34.882	4.269	34.062	1491.162	27.664	32.255	-0.058
1450.0	4.378	34.899	4.258	34.302	1491.992	27.678	32.269	-0.087
1500.0	4.327	34.918	4.203	34.549	1492.640	27.699	32.292	-0.115
1550.0	4.264	34.930	4.136	34.793	1493.229	27.716	32.310	-0.142
1600.0	4.185	34.938	4.053	35.035	1493.746	27.731	32.327	-0.168
1650.0	4.136	34.948	4.000	35.275	1494.391	27.745	32.342	-0.194
1700.0	4.092	34.954	3.952	35.511	1495.052	27.755	32.353	-0.220
1750.0	4.043	34.957	3.899	35.744	1495.689	27.763	32.362	-0.245
1800.0	3.943	34.957	3.796	35.983	1496.109	27.773	32.376	-0.270
1850.0	3.898	34.962	3.746	36.218	1496.765	27.782	32.386	-0.295
1900.0	3.847	34.963	3.691	36.450	1497.392	27.789	32.394	-0.319
1950.0	3.809	34.964	3.649	36.680	1498.073	27.794	32.400	-0.343
2000.0	3.763	34.963	3.599	36.910	1498.718	27.798	32.406	-0.367
2100.0	3.647	34.958	3.475	37.370	1499.906	27.806	32.417	-0.416
2200.0	3.552	34.954	3.372	37.827	1501.184	27.813	32.427	-0.463
2300.0	3.430	34.947	3.242	38.285	1502.346	27.820	32.437	-0.510
2400.0	3.345	34.941	3.149	38.738	1503.667	27.824	32.444	-0.558
2500.0	3.231	34.933	3.027	39.193	1504.865	27.829	32.452	-0.604
2600.0	3.150	34.932	2.937	39.648	1506.213	27.837	32.462	-0.651
2608.0	3.135	34.930	2.922	39.684	1506.282	27.836	32.463	-0.654

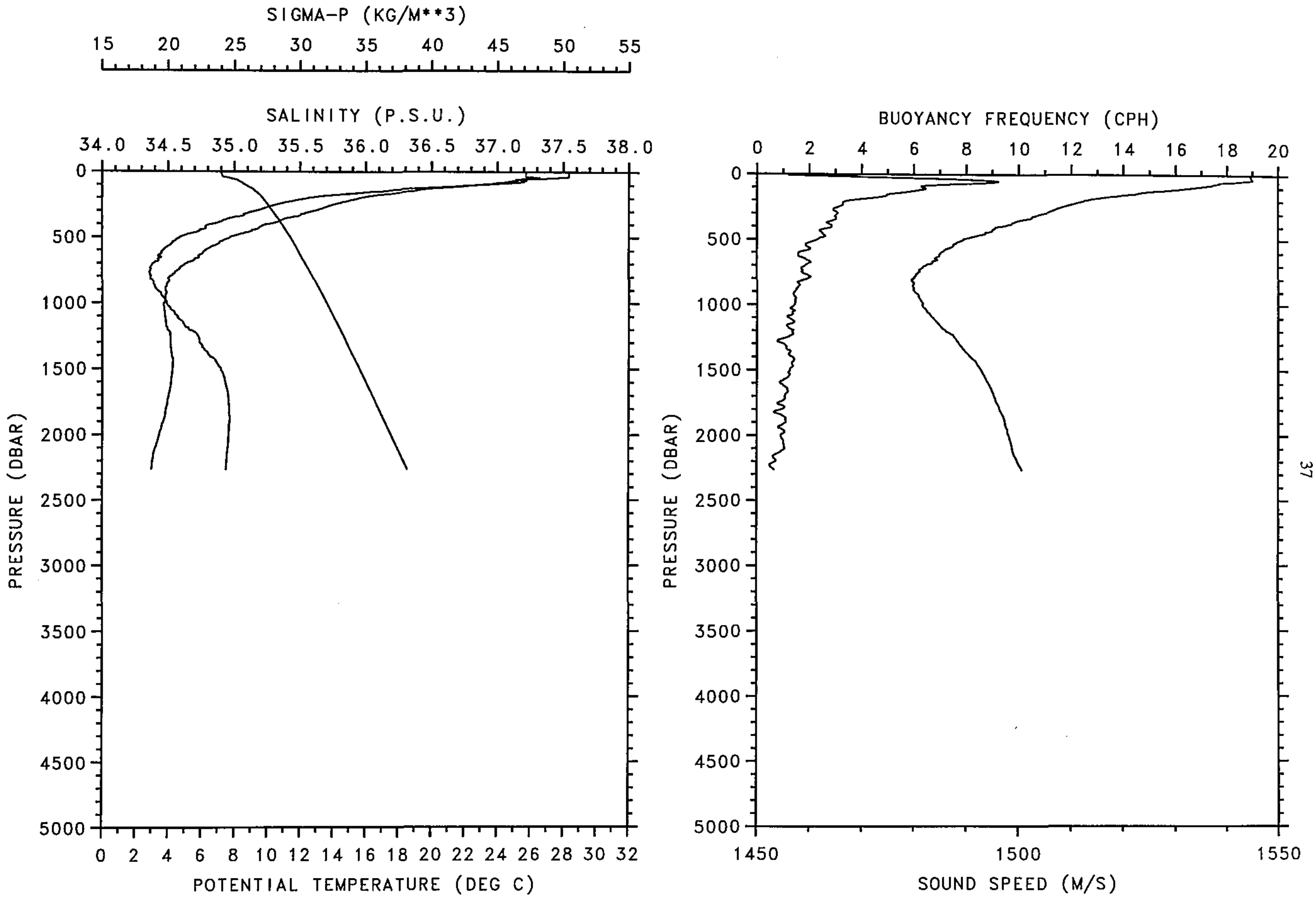




samba10007.ecp

Station : 8	Cruise : SAMBA1
Date : 24-02-94	Ship : SUROIT
Bottom depth: 2370 m	Institute: IFREMER
Position : S 13 10.70 W 38 4.80	

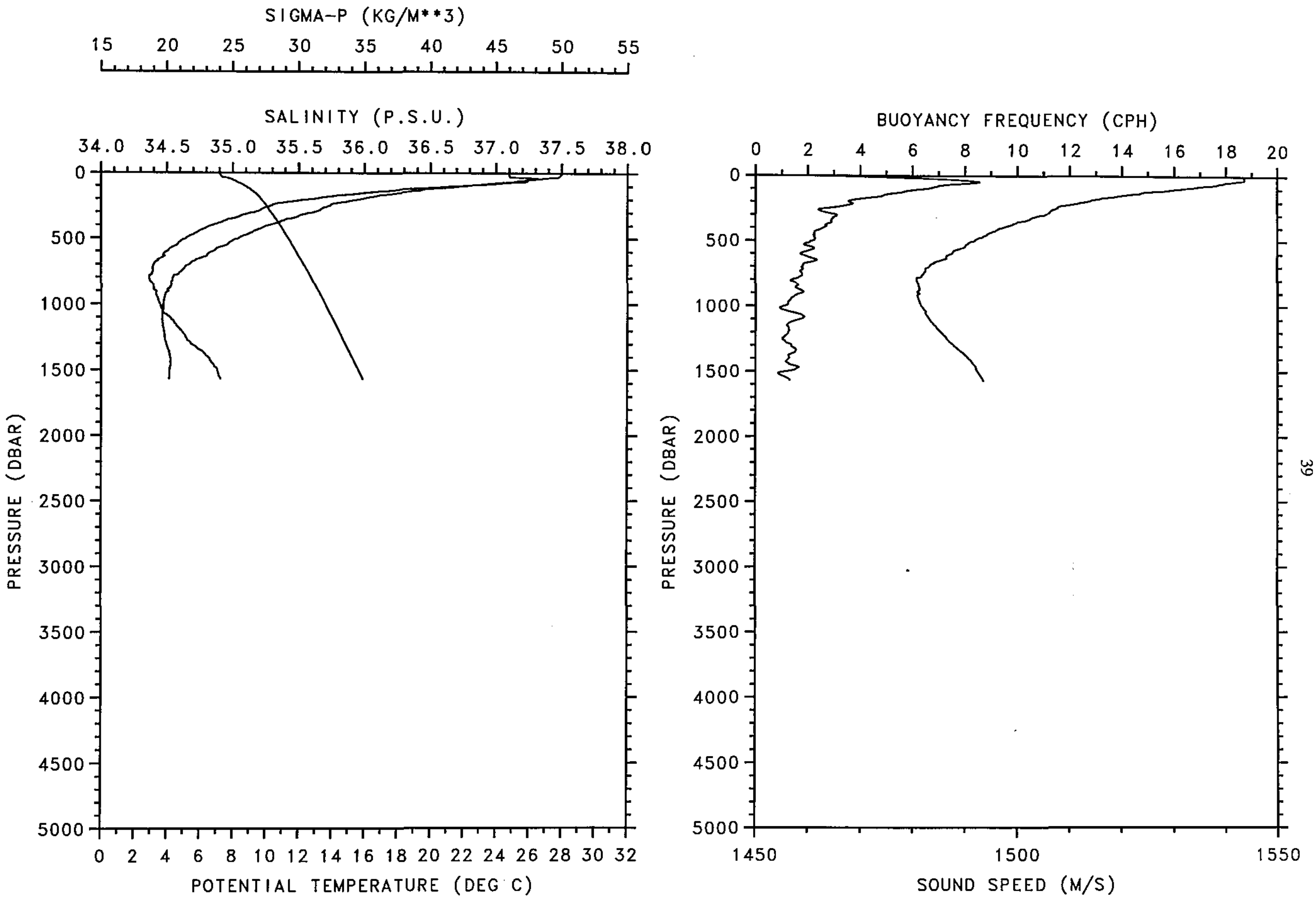
PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	28.357	37.216	28.355	23.987	1544.601	23.945	28.091	1.622
20.0	28.350	37.214	28.345	24.030	1544.752	23.947	28.093	1.583
30.0	28.343	37.214	28.336	24.075	1544.906	23.950	28.096	1.543
40.0	28.205	37.257	28.195	24.196	1544.819	24.029	28.177	1.503
50.0	26.953	37.301	26.941	24.681	1542.256	24.471	28.634	1.467
60.0	25.320	37.137	25.307	25.116	1538.467	24.863	29.047	1.434
70.0	24.912	37.206	24.897	25.337	1537.735	25.041	29.230	1.404
80.0	24.507	37.181	24.490	25.485	1536.898	25.146	29.341	1.375
90.0	23.756	37.036	23.737	25.644	1535.065	25.262	29.467	1.347
100.0	22.858	36.865	22.838	25.822	1532.788	25.396	29.615	1.320
150.0	18.635	36.082	18.608	26.598	1521.334	25.948	30.235	1.204
200.0	15.592	35.554	15.561	27.150	1512.476	26.274	30.616	1.107
250.0	14.025	35.316	13.989	27.536	1508.054	26.434	30.806	1.021
300.0	12.765	35.150	12.724	27.894	1504.535	26.564	30.962	0.940
350.0	11.387	34.984	11.343	28.261	1500.467	26.700	31.127	0.866
400.0	10.053	34.828	10.006	28.611	1496.396	26.817	31.273	0.797
450.0	9.113	34.738	9.063	28.930	1493.696	26.903	31.380	0.734
500.0	7.793	34.591	7.742	29.258	1489.404	26.991	31.499	0.674
550.0	7.097	34.530	7.044	29.544	1487.483	27.042	31.567	0.618
600.0	6.314	34.463	6.260	29.834	1485.164	27.095	31.639	0.565
650.0	5.942	34.444	5.885	30.099	1484.490	27.128	31.681	0.513
700.0	5.185	34.392	5.127	30.390	1482.205	27.178	31.751	0.464
750.0	4.687	34.368	4.628	30.665	1480.966	27.216	31.802	0.416
800.0	4.198	34.369	4.138	30.957	1479.772	27.270	31.868	0.371
850.0	3.989	34.386	3.926	31.225	1479.749	27.305	31.909	0.328
900.0	3.877	34.413	3.811	31.489	1480.142	27.339	31.945	0.287
950.0	3.901	34.456	3.830	31.749	1481.126	27.371	31.976	0.247
1000.0	3.808	34.485	3.734	32.012	1481.602	27.404	32.012	0.209
1050.0	3.812	34.516	3.734	32.264	1482.488	27.428	32.036	0.171
1100.0	3.888	34.570	3.805	32.524	1483.706	27.464	32.070	0.135
1150.0	3.932	34.611	3.844	32.779	1484.773	27.493	32.097	0.100
1200.0	4.039	34.654	3.946	33.025	1486.107	27.517	32.118	0.066
1250.0	4.216	34.721	4.117	33.281	1487.761	27.552	32.148	0.033
1300.0	4.223	34.735	4.119	33.517	1488.640	27.563	32.159	0.000
1350.0	4.271	34.772	4.162	33.766	1489.719	27.588	32.182	-0.032
1400.0	4.328	34.809	4.214	34.013	1490.836	27.612	32.205	-0.063
1450.0	4.400	34.862	4.280	34.269	1492.035	27.647	32.237	-0.094
1500.0	4.384	34.898	4.260	34.525	1492.849	27.677	32.268	-0.123
1550.0	4.343	34.917	4.214	34.771	1493.539	27.697	32.289	-0.151
1600.0	4.302	34.929	4.169	35.011	1494.219	27.712	32.305	-0.178
1650.0	4.245	34.942	4.108	35.254	1494.836	27.729	32.323	-0.205
1700.0	4.165	34.952	4.024	35.498	1495.353	27.745	32.342	-0.232
1750.0	4.082	34.955	3.938	35.737	1495.848	27.757	32.356	-0.258
1800.0	4.003	34.959	3.855	35.976	1496.362	27.769	32.370	-0.283
1850.0	3.962	34.960	3.810	36.207	1497.030	27.774	32.376	-0.308
1900.0	3.850	34.962	3.694	36.449	1497.403	27.787	32.393	-0.333
1950.0	3.741	34.957	3.582	36.685	1497.779	27.795	32.403	-0.357
2000.0	3.616	34.954	3.454	36.925	1498.090	27.805	32.417	-0.380
2100.0	3.382	34.948	3.214	37.402	1498.777	27.824	32.442	-0.426
2200.0	3.209	34.938	3.035	37.866	1499.715	27.832	32.455	-0.471
2267.0	3.154	34.935	2.974	38.171	1500.607	27.836	32.460	-0.500



samba10008.ecp

Station : 9	Cruise : SAMBA1
Date : 24-02-94	Ship : SUROIT
Bottom depth: 1690 m	Institute: IFREMER
Position : S 13 9.50 W 38 15.60	

PRESSURE dbar	TEMPERATURE deg.C	SALINITY p.s.u.	POTENTIAL TEMP. deg.C	SIGMAP kg/m**3	SOUND SPEED m/s	SIGMA0 kg/m**3	SIGMA1 kg/m**3	DYNAMIC HEIGHT dyn.m.
10.0	27.957	37.098	27.955	24.030	1543.604	23.988	28.140	1.630
20.0	27.900	37.105	27.895	24.097	1543.655	24.013	28.166	1.591
30.0	27.807	37.104	27.800	24.170	1543.617	24.044	28.197	1.552
40.0	26.868	37.306	26.859	24.670	1541.901	24.501	28.665	1.515
50.0	25.939	37.260	25.928	24.973	1539.886	24.762	28.938	1.482
60.0	25.332	37.243	25.319	25.193	1538.609	24.939	29.123	1.451
70.0	24.859	37.177	24.844	25.332	1537.577	25.035	29.225	1.421
80.0	23.705	37.027	23.688	25.610	1534.761	25.270	29.476	1.393
90.0	22.878	36.881	22.860	25.785	1532.689	25.402	29.620	1.366
100.0	22.036	36.718	22.016	25.947	1530.509	25.519	29.751	1.340
150.0	18.124	36.006	18.098	26.669	1519.774	26.018	30.314	1.228
200.0	15.738	35.580	15.707	27.137	1512.959	26.261	30.600	1.133
250.0	13.876	35.291	13.840	27.549	1507.541	26.446	30.821	1.047
300.0	12.934	35.166	12.893	27.872	1505.119	26.543	30.938	0.967
350.0	11.458	34.987	11.413	28.250	1500.716	26.690	31.115	0.892
400.0	10.230	34.845	10.183	28.592	1497.050	26.800	31.252	0.823
450.0	9.280	34.737	9.230	28.901	1494.307	26.875	31.349	0.758
500.0	8.417	34.647	8.364	29.201	1491.827	26.941	31.435	0.697
550.0	7.655	34.575	7.600	29.493	1489.683	26.999	31.511	0.639
600.0	6.846	34.504	6.789	29.788	1487.301	27.057	31.588	0.583
650.0	6.142	34.459	6.084	30.083	1485.303	27.114	31.663	0.530
700.0	5.423	34.403	5.364	30.367	1483.182	27.159	31.726	0.479
750.0	4.964	34.397	4.903	30.652	1482.138	27.208	31.787	0.431
800.0	4.457	34.368	4.395	30.923	1480.844	27.242	31.833	0.385
850.0	4.327	34.391	4.262	31.187	1481.162	27.274	31.869	0.341
900.0	4.134	34.416	4.066	31.459	1481.220	27.315	31.915	0.298
950.0	3.916	34.427	3.845	31.724	1481.151	27.346	31.952	0.257
1000.0	3.833	34.445	3.759	31.977	1481.655	27.369	31.977	0.217
1050.0	3.801	34.461	3.723	32.222	1482.370	27.386	31.994	0.177
1100.0	3.787	34.522	3.705	32.500	1483.220	27.436	32.044	0.139
1150.0	3.841	34.564	3.754	32.753	1484.331	27.465	32.071	0.103
1200.0	3.898	34.608	3.806	33.008	1485.458	27.494	32.099	0.068
1250.0	3.946	34.640	3.849	33.254	1486.531	27.515	32.119	0.034
1300.0	4.047	34.682	3.945	33.500	1487.839	27.539	32.140	0.000
1350.0	4.198	34.756	4.090	33.764	1489.396	27.583	32.179	-0.033
1400.0	4.296	34.808	4.182	34.016	1490.702	27.614	32.208	-0.064
1450.0	4.348	34.846	4.229	34.264	1491.800	27.639	32.232	-0.094
1500.0	4.286	34.882	4.163	34.527	1492.423	27.675	32.269	-0.123
1550.0	4.278	34.897	4.150	34.765	1493.244	27.688	32.282	-0.152
1571.0	4.262	34.907	4.132	34.869	1493.541	27.698	32.292	-0.163



samba10009.ecp

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4 LAGRANGIAN MEASUREMENTS

4.1 Subsurface floats

Subsurface floats were first developed by J.C. Swallow (1955) and soon revealed unexpected strong deep currents (e.g. Crease, 1962). However their use to track water particles over periods of a few years awaited until the CMOS revolution (for low energy consumption of the electronics) at the end of the 1970s (Rossby et al., 1975; Richardson et al., 1981). These floats which send acoustic pulses to be received and dated by moored autonomous listening stations are named SOFAR (for SOund Fixing And Ranging) and a few hundreds have been used until the end of the 1980s.

For WOCE, the subsurface floats will be generally of the RAFOS type (Rossby, Dorson and Fontaine, 1986), much lighter (a few tens of kg versus a few hundreds of kg), much smaller (1 to 2 m long versus more than 7 m long) and much cheaper (at least a factor 2) than the SOFARs.

After launching at sea surface, RAFOS type floats sink to a predetermined depth where they stay while freely drifting entrained by surrounding water motions, whence their lagrangian character, exactly like their fathers the SOFARs and their grand-fathers the Swallow floats. After a certain period of time at depth, they come back to the surface and transmit via the ARGOS system the information collected at depth, which is temperature, pressure and times of arrivals of sound signals sent by distant sources immerged near the base of the main thermocline where sound speed is at a minimum (the SOFAR channel, whence the name RAFOS, i.e. SOFAR spelled backward). From the times of sound propagation between several sources (whose positions are known) and a given float, one is able to estimate the float positions at depth, thus the pathway and velocity of the water particle that this float tagged.

Whereas the original RAFOS float (developed by T. Rossby and his colleagues at URI in the 1980s) is a one-shot float (i.e. it comes back to the surface at the end of its mission at depth), the MARVOR float (meaning sea horse in the old celtic language of Brittany), developed by IFREMER and TEKELEC (Ollitrault, Loaëc and Dumortier, 1994) is a multicycle float since it can surface after a period at depth, transmit to ARGOS for a few days and then dive back at its prescribed depth, and so on... (up to 99 cycles). The same kind of multicycle subsurface float named ALACE (for Autonomous Lagrangian Circulation Explorer), has been designed by WRC and SIO but it doesn't comprise the acoustic part (Davis et al., 1992). It is consequently slightly cheaper than MARVOR (10 k$ versus 15 k$ at the time of this writing) and should be used during WOCE mainly in the Southern and Pacific Oceans where there is no acoustic sound source coverage (either due to bad sound transmission or due to the too large area to be covered). Of course the ALACEs will give only the overall displacements between two surfacings, and thus only the large scales of the oceanic circulation with a cycling period of the order of 15 to 30 days. On the other hand RAFOS type floats will give also the meso scales (the most energetic part of ocean currents), if we dispose of acoustic emissions every 1 or 2 days. A few ALFOS prototypes (ALACE with a RAFOS acoustic part) have also been developed by WRC and WHOI.

During the SAMBA1 cruise, 20 MARVORs, one ALFOS and one VCM (a one shot RAFOS with an attached propellor to measure vertical currents) were launched by LPO/IFREMER. 10 original RAFOS were also launched by WHOI (R. Tavares).

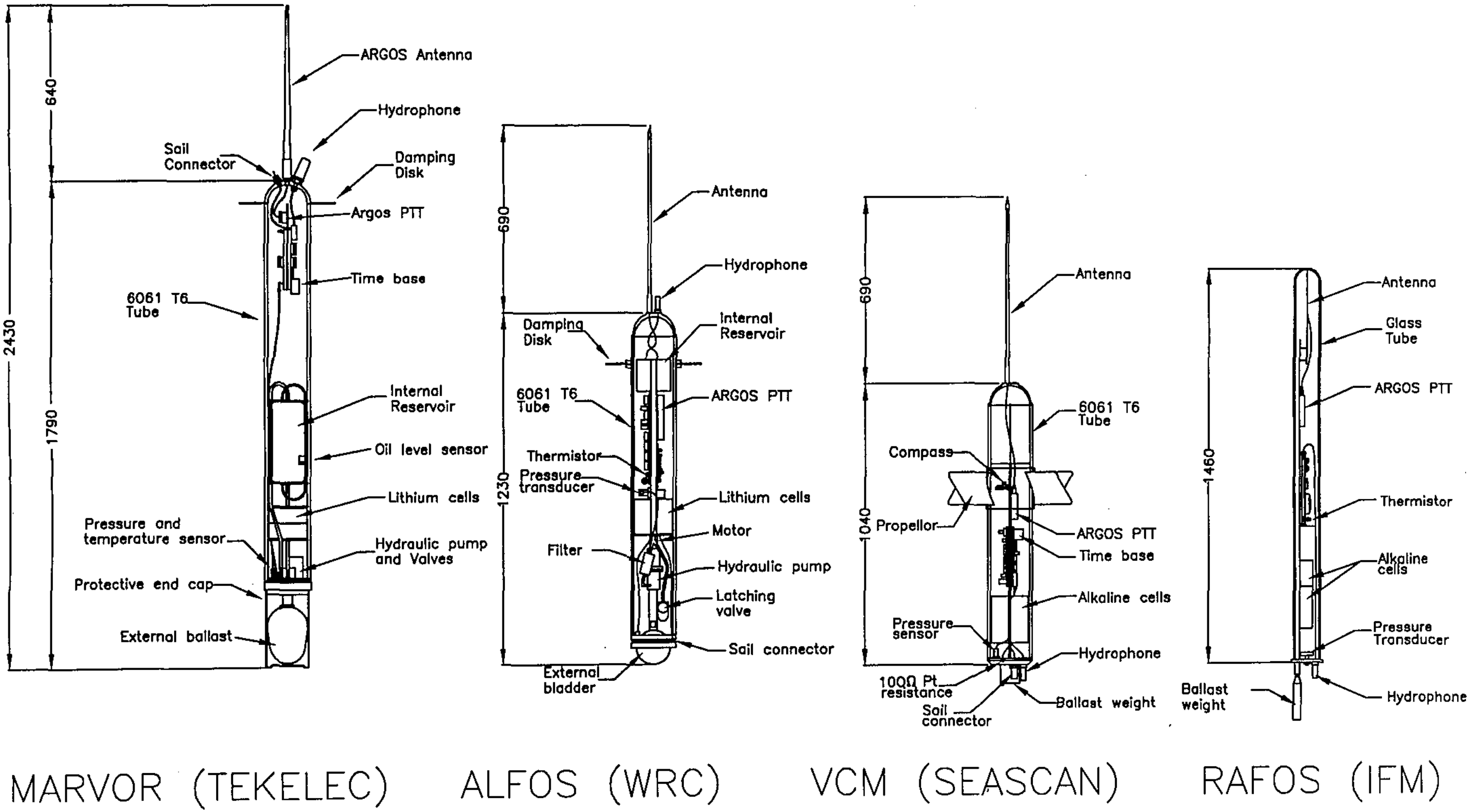

Figure 9 Schematics of the floats launched during SAMBA1.

4.2 MARVOR

MARVOR is a multicycle subsurface RAFOS type float, developed by IFREMER and TEKELEC (the latter being the manufacturer).

4.2.1 Mechanical design

The housing of the float is made up of a metallic cylinder, closed at top by a semi-spherical endcap, fitted with an ARGOS flexible antenna, a hydrophone, a damping disk and a SAIL (Serial ASCII Instrumentation Loop) connector. The bottom end cap, comprises all electro-hydraulic parts inside the tube and a neoprene ballast tank, outside, protected by a fiber glass housing open to sea water. The pressure sensor is connected through the cap with ballast oil and the temperature probe, a 100 Ω platinum resistor, is stuck on the internal face of the cap. The overall height of the float is 2.43 m and the mass about 39 kg (Fig. 9).

To avoid any corrosion during the foreseen long term missions, all metallic parts in contact with sea water are made of the same 6061 T-6 aluminum alloy, anodised and sealed with potassium bichromate. Three-month long tests under pressure have allowed an estimation of the tube creep at the maximal operating depth (2500 m). A value of 1 m day^{-1} resulted as the upper bound for the sinking rate.Non metallic coatings were chosen for their proven uses in marine environment.

The hydraulic system permits the float to go either up or down by transferring oil from an internal reservoir to the ballast. Two valves, with different flow rates, are used to let oil flow from the ballast to the reservoir, under the effect of hydrostatic pressure. A motor driven micro-pump transfers oil from the reservoir to the ballast. The hydraulic components were chosen for their low leak rates when not in operation (normally of the order of a few mm^3 h^{-1}).

4.2.2 Depth control

The float stabilisation in the water column is based on the precise control of its density, which must be matched to that of seawater, for the float to be neutrally buoyant. From the information provided by the pressure sensor, the float modifies the volume of the ballast to reach the desired pressure. MARVOR is an isobaric float. This avoids the necessary ballasting operations before launching of ordinary subsurface floats, for which one must know in-situ sea water characteristics as well as the float mass, volume, compressibility and thermal expansion coefficients (Rossby, Dorson and Fontaine, 1986). The MARVOR float only requires the choice of an operating pressure, between 500 and 2500 dbar.

The float is also able to compensate for creep of the housing, corrosion, fouling or other detrimental phenomena which may occur on a long-term mission. This is possible because the float can change the volume of the ballast by a 1 cm^3 increment, which induces a 10 m depth variation.

When the float is at the surface, the buoyancy is about 1200 g, which gives a good emergence of the ARGOS antenna. To descend to the required depth, the two hydraulic valves are opened in turn. Initially the high flow rate valve (flow rate of the order of 200 cm^3 min^{-1} when float is at the surface) is activated. Under the effect of external pressure (inside the tube, pressure is about 0.7 bar), oil is transferred from the ballast to the internal reservoir, which decreases the buoyancy. When the measured pressure is over 15 dbar, the float turns off the high flow valve.

Then the float performs no hydraulic action and waits for depth stabilisation.

After stabilisation, the float uses the other hydraulic valve, if necessary, to obtain the required depth. This valve is fitted with a nozzle, that gives a flow rate of the order of 500 $cm^3 min^{-1}$ under a pressure of 1000 dbar. As characteristics change from one valve to another and the flow rate is pressure dependent, the float first opens this valve for a very short time (0.4 s) and measures the pressure when it is stabilised again. Thereafter, the time of opening of the valve is computed to get to the desired depth (or pressure) value. Since the first sea trials in 1992, this method has been successfully tested about forty times, with floats programmed to reach 800, 1000 or 1200 dbar. The desired pressure values were attained with a precision better than 30 dbar.

When the float is neutral, the pressure is measured at regular intervals and adjustments are possible to keep the float at the operating depth if required. To come back to the surface, the float activates the hydraulic pump. To reduce energy consumption, the electric motor of the pump is turned on for a few seconds, each time the float has stabilised. As soon as the measured pressure is lower than 50 dbar, the pump is turned on until the reservoir is empty and thus, the buoyancy at a maximum.

For a typical cycle at 1000 dbar, the electric energy consumption of the hydraulics is about 0.5 Ah. The hydraulic system is designed and manufactured by HYDRO R. LEDUC (Nancy, France).

The detailed algorithm for the depth control, (with the parameter values used in the SAMBA1 experiment) is given below, for those willing to interpret the pressure records given by the SAMBA1 MARVORs.

The plunging phase :

This is a critical phase since an excessive opening of one valve could cause the float to dive too deep (buckling pressure ≈3800 dbar). The plunging phase is divided into 2 steps proper.

<u>First step :</u> The High Flow (HF) rate valve is opened at regular intervals (more exactly there is a 5 min waiting time between actions) for a 8.0 s duration, as long as the pressure P is less than 5 dbar. Afterwards, the HF valve is opened only during $8.0 \times \frac{15-P}{15}$ s, as long as the pressure P is less than 15 dbar.

<u>Second step :</u> The float is now plunging (P > 15 dbar), and the pressure is still measured at 5-min intervals. If $P_n - P_{n-1} < 3$ dbar, (P_n being the pressure measured after n 5-min intervals), the Low Flow (LF) rate valve is opened for a time τ_k :

$$\tau_1 = 0.4 \text{ s}$$

$$\text{for } k > 1, \quad \tau_k = \frac{1}{2}\tau_{k-1} \times \frac{OP + \Delta - P_{n-1}}{P_{n-1} - P_{old}} \times \frac{P_{old}}{P_{n-1}} \qquad \text{if } P_{n-1} > P_{old}$$

$$\tau_k = 2\tau_{k-1} + 0.1 \text{ s} \qquad \text{if } P_{n-1} \le P_{old}$$

$$0.4 \text{ s} \le \tau_k \le 3.0 \text{ s}$$

The pressure measured immediately before the present valve opening is P_n, while that measured immediately before the previous opening is P_{old}. OP is operating pressure set to 800 dbar for SAMBA1 and Δ is the allowed excursion on both sides of the operating pressure (set to 30 dbar for SAMBA1).

After a few openings of the LF valve, MARVOR will be within its operating pressure interval [OP - Δ , OP + Δ] or deeper. As soon as P > OP - Δ, the pressure is measured only every 10 min. Then if $P_n - P_{n-1} < 3$ dbar the plunging phase is normally finished (i.e. MARVOR is within its operating pressure interval or has risen shallower). However, if $P_n > OP + \Delta$, the pump is turned on for 2.0 s, and as many times as necessary (with a 10 min interval between activations) so that $P < OP + \Delta$. Then the plunging phase is finished.

The behaviour at depth during the listening phase :

The pressure is now measured every hour. Each time P is outside the operating pressure interval, a counter C1 is incremented by one. If after several pressure excursions out but on the same side of the operating pressure interval, the float comes back within its assigned interval, C1 is set to 0. If the float goes on the other side of its assigned pressure interval, C1 is set to 1. If at the end of the last listening window opened during the current listening phase[1], C1 ≥ 12, then a repositionning order is issued, and a second counter C2 is incremented by one. However, this counter is incremented only if the pressure, which is then measured instantly confirms that MARVOR is outside its operating pressure interval.

C2 is also incremented only if the successive repositioning orders are issued from excursions on the same side of the pressure interval. If C2 = 10, then the depth correction is undertaken.

If $P_n > OP + \Delta$, the pump is turned on for a time τ_k :

$$\tau_1 = 3.0\ \text{s}\quad \text{(if it is the first hydraulic action for the depth control)}$$

$$\tau_k = \frac{1}{2}\tau_{k-1} \times \frac{P_n - OP + \Delta}{P_{old} - P_n} \qquad \text{if } P_{old} > P_n$$

$$\tau_k = 2\tau_{k-1} + 0.1\ \text{s} \qquad \text{if } P_{old} \le P_n$$

$0 \le \tau_k \le 10.0$ s

If $P_n < OP - \Delta$, the LF valve is opened for a time τ_k :

$$\tau_1 = 0.4\ \text{s}\quad \text{(if it is the first hydraulic action for the depth control)}$$

$$\tau_k = \frac{1}{2}\tau_{k-1} \times \frac{OP + \Delta - P_n}{P_n - P_{old}} \times \frac{P_{old}}{P_n} \qquad \text{if } P_n > P_{old}$$

$$\tau_k = 2\tau_{k-1} + 0.1\ \text{s} \qquad \text{if } P_n \le P_{old}$$

$0 \le \tau_k \le 3.0$ s

P_n is the pressure measured immediately before the hydraulic action and P_{old} the pressure measured immediately before the previous hydraulic action.

To get an idea of the volume fluxes concerned, HF rate is ≈ 200 $cm^3\ min^{-1}$ at atmospheric external pressure (and 700 mbar internal pressure), ≈ 400 $cm^3\ min^{-1}$ at 10 dbar and ≈ 800 $cm^3\ min^{-1}$ at 20 dbar. LF rate in $cm^3\ min^{-1}$ is given approximately by $17\sqrt{P}$ with P in dbar (that is, 170 $cm^3\ min^{-1}$ at 100 dbar, and 540 $cm^3\ min^{-1}$ at 1000 dbar). The pump flow rate in $cm^3\ min^{-1}$ is given by $100 - 0.013 \cdot P$ with P in dbar (that is roughly 85 $cm^3\ min^{-1}$ at 1000 dbar).

The rising phase

During this phase, pressure is measured every 2 min. If between two successive measurements, the pressure doesn't decrease by more than 15 dbar, which indicates a slowing down of the float rising, the pump is turned on for 10.0 s, if P > 50 dbar.

When P ≤ 50 dbar, the pump is turned on for 60.0 s, with a 2 min interval between activations, until the internal reservoir is empty.

1.For the definitions of listening phase and listening window, see Sections 4.2.3 and 4.2.4.

4.2.3 Data acquisition

To get the data necessary to estimate its position at depth, the float regularly listens and detects sound signals emitted at fixed times by acoustic sources moored at known geographic positions. These signals are frequency modulated between 259.375 Hz and 260.898 Hz over a 80 s duration. Signals are picked up by the omnidirectional hydrophone and processed by a numerical receiver. They are amplified, filtered, sampled and correlated in real time with a copy of the theoretical emitted signal. The acoustic receiver transmits the results to the main Central Processor Unit board every 0.3075 s and only the samples exhibiting the strongest correlation level are dated and stored in the RAM memory. Standard Webb Research Corporation sound sources (180 db rel. to 1 μPa at 1 m) are easily detected at distances of 1000 km with propagation in the SOFAR channel wave guide.

The times of arrival (TOAs) of the detected signals are dated with a high precision clock, with a nominal drift of less than 3 seconds per year. This clock is made up of a quartz oscillator with automatic compensation of temperature effects on the frequency. Furthermore, when the float is at the surface and transmits to the ARGOS satellites, the internal time can be compared with satellite UTC time with an accuracy of ±0.015 s. It is possible thus to account for aging, which is not compensated.

Pressure and temperature are sampled every hour with nominal accuracies of ±10 dbar between 500 and 2500 dbar and ±0.03 °C between -2 to +35 °C respectively. Averaged values over a chosen number of samples are stored in memory.

The data acquisition system (pressure, temperature and acoustic receiver) comprises two micro controllers which are linked to the CPU board by a SAIL open collector interface. This has been developed by SEASCAN (Falmouth, USA), except for the hydrophone, designed by PONS (Aubagne, France).

Before launching, a few parameters have to be set (number of cycles, operating pressure, duration of acoustic listening windows,...), which is done by linking a PC computer to the external SAIL connector. Each cycle is logically divided into four phases: descent to the operating pressure, data acquisition at depth, ascent to the surface and ARGOS transmission. A general data acquisition phase comprises several listening phases, and its duration is an integral multiple (possibly one) of the source emission period. Within a listening phase, several listening windows (27 min maximum duration) are successively opened to detect and record the times of arrival of the signals sent by the various sound sources.

For SAMBA1, listening phases were 24 h long (beginning at 0h) and the 20 MARVOR floats were actually listening during 3 27-min windows beginning at 0^h29min, 0^h59min and 1^h29min relative to UTC time at launch. Within each window, times of arrival (TOA) of the 3 best correlated signals received, separated by at least 2 s were stored.

4.2.4 ARGOS transmission

At the end of a cycle, when the float is at the surface, all the data gathered at depth (times of arrival, pressure and temperature values) are transmitted through the ARGOS system. With the two presently orbiting satellites NOAA D and NOAA J (NOAA J has replaced NOAA H on January 1st 1995), the cumulative visibility time over 24 hours varies between 80 minutes at the Equator and 246 minutes at 65° latitude. A mean pass duration is about 10 minutes long and each ARGOS message includes 256 bits of user data. The emission period is programmable and is typically of the order of 1 min. The ARGOS system also provides geographic location of the float at the surface, which can be used as a check of the last deep estimated position or to recover the float at the end of its multicycle mission.

The antenna, which is externally attached to the upper endcap and has to support all the stresses imposed by the environment (submersion to high pressure, salt water, rough seas at the surface...), is a half-wave whip which ensures a good quality of transmission for low satellite elevations. The radiating element and the tuning circuit occupy the upper part of the antenna to keep them away from the sea level. These components are encased in water resistant moulded polyurethane. To limit the amplitude of the float vertical motions at the surface, a damping disk is installed at top of the pressure tube.

For a one-day transmission, energy consumption is of the order of 0.25 Ah. This energy is provided by one lithium battery pack (40 Ah under 14 V), also used for the hydraulics. To save time spent at the surface for data transfer, the ARGOS transmitter (designed by IESM, Lorient, France) may use up to 4 identification numbers. For SAMBA1 floats only one identification number has been used.

4.2.5 MARVOR ARGOS messages (SAMBA1)

There is one 256-bit ARGOS message for each listening phase at depth. For SAMBA1, the phase duration is 24 h, and there are 60 phases. Thus there are 60 different ARGOS messages generated and transmitted at the end of each cycle. However, these messages are not emitted sequentially but within groups of 11 messages so that the float trajectory can be reconstructed properly even if one group of messages has been lost, due to a bad satellite coverage or a poor emission during rough weather for example.

Messages are numbered from 0 to 59 and emitted precisely in 6 groups of 11 messages each. Each group is emitted 50 times. Since the mean period of emission for the ARGOS PTT was programmed to 49 s, it takes $50\times11\times49$ s $\approx$ 7h29min for each group of 11 messages to be emitted. Thus total ARGOS emission is $\approx$ 44h55min long, slightly less than 2 days.

The repartition of the different messages within the 6 groups is as follows :

group 1	message# 00, 06, 12, 18, 24, 30, 36, 42, 48, 54, 00.
group 2	message# 01, 07, 13, 19, 25, 31, 37, 43, 49, 55, 07.
group 3	message# 02, 08, 14, 20, 26, 32, 38, 44, 50, 56, 14.
group 4	message# 03, 09, 15, 21, 27, 33, 39, 45, 51, 57, 21.
group 5	message# 04, 10, 16, 22, 28, 34, 40, 46, 52, 58, 28.
group 6	message# 05, 11, 17, 23, 29, 35, 41, 47, 53, 59, 35.

The messages # 00, 07, 14, 21, 28 and 35 (those on the first diagonal, and only those ones, not those at the end of each group), are called technical since they contain the float internal time at the instant of emission and battery energy levels, besides the usual TOAs, etc...

Precisely, for a 256-bit message, the information is coded as given in Table 2.

Table 2 MARVOR ARGOS message structure

Data	Emission toward ARGOS satellites (bit n° in the message)	Retransmission from ARGOS processing center	Comments
message type	1 bit (#1)	I2	0 if an ordinary message 1 if a technical message
day number	10 bits (#2 to #11)	I4	max 1023
beginning of the listening phase (h)	5 bits (#12 to #16)	I2	
parity P1 calculated from bits 1 to 16	1 bit (#17)	I2	0 if even parity 1 if odd parity
TOA (1/10 s)	14 bits (#18 to #31, #39 to #52, #60 to #73, #81 to #94, #102 to #115, #123 to #136, #144 to #157, #165 to #178, #186 to #199, #207 to #220)	I5	In an ordinary message there are 10 TOAs (with the associated window n° and correlation height). In a technical message, there are only 8 TOAs. TOAs are relative to the beginning of the listening window.
window n° and correlation height	7 bits (#32 to #38, #53 to #59, #74 to #80, #95 to #101, #116 to #122, #137 to #143, #158 to #164, #179 to #185, #200 to #206, #221 to #227)	I3	the window nº (0 to 15) is coded on the 4 m.s. bits, while the correlation height (0 to 7) is coded on the 3 l.s. bits
average temperature (1/100°C)	12 bits (#228 to #239)	I4	
average pressure (dbar)	12 bits (#240 to #251)	I4	

Table 2 MARVOR ARGOS message structure

Data	Emission toward ARGOS satellites (bit n° in the message)	Retransmission from ARGOS processing center	Comments
parity P2, P3, P4	3 bits (#252 to #254)	I2	P2 is calculated from bits #18 to #122, P3 from bits #23 to #227 and P4 from bits #228 to #251
float internal time (day, h, min, s)	4+5+6+6=21 bits (#186 to #206)	I5 and I3	the 14 m.s. bits are decimal coded in I5, the 7 l.s. bits in I3.
7V battery energy level for electronics (in multiple of 64 m Ah) 14 V battery energy level for hydraulics and ARGOS (in multiple of 64 m Ah)	10+10+1unused =21bits (#207 to #227)	I5 and I3	the 7 V energy level is coded on the 10 m.s. bits. the 14 V energy level is coded on the 10 l.s. bits.

An ordinary 256-bit message contains the 10 greatest signals (TOA, window nº and correlation height coded on 21 bits) in decreasing order received during the listening phase ; while a technical 256-bit message contains, instead of the 9th and 10th greatest signals, the float internal time and the battery energy levels for electronics and for hydraulics and ARGOS respectively.

ARGOS messages received from Toulouse Center are decimal coded. Here is an example of the first messages received from MARVOR float #101 at the end of its first cycle.

01309 21534 127 28 H 2 1994-04-19 06:25:21 -26.015 321.275 0.020 401650510

1994-04-19 06:17:59.938	1	00	92	00	00
		5158	23	4392	04
		2996	11	9657	17
		8747	16	15215	08
		7658	08	9496	00
		3307	00	00	00
		487	813	07	00
1994-04-19 06:18:51.932	1	00	98	00	01
		5072	23	4441	07
		9847	23	3165	14
		3138	08	12642	00
		2879	16	6834	00
		850	08	00	00
		487	813	07	00
1994-04-19 06:19:39.921	1	00	104	00	01
		4481	07	3291	15
		5001	23	9905	19
		1422	00	1437	16
		6074	08	1419	08
		13380	00	00	00
		478	814	05	00
1994-04-19 06:20:30.923	1	00	50	00	01

		1665	15	6262	23
		4714	02	3977	16
		3587	08	3873	08
		5170	16	7625	00
		2703	00	00	00
		1034	584	00	00
1994-04-19 06:21:14.929	1	01	50	00	00
		1665	15	6262	23
		4714	02	3977	16
		3587	08	3873	08
		5170	16	7625	00
		13514	79	15604	87
		1034	584	02	00
1994-04-19 06:22:08.924	1	00	56	00	01
		1843	15	8393	23
		4684	04	4709	03
		3694	16	12002	08
		7704	16	7080	08
		334	00	00	00
		498	806	07	00

4.3 ALACE and ALFOS

4.3.1 Generalities

ALACE is a multicycle subsurface float (but without acoustic positioning) developed by SIO (Russ Davis) and WRC (Doug Webb) (WRC is the manufacturer).

Like MARVOR, ALACE is made of 6061 T-6 aluminum, and changes its buoyancy by moving hydraulic fluid from an internal reservoir to inflate an external bladder, or by allowing fluid to flow from the bladder back into the internal reservoir. ALACE is smaller (1.80 m versus 2.43 m) and lighter (23 kg versus 39 kg) than MARVOR (Fig. 9). ALACE has to be ballasted prior to launching because ALACE doesn't have an active control of its depth. However, if correctly ballasted, ALACE should dive at the beginning of each cycle at its prescribed depth with a good reproductibility, because the bladder retracts into a hemispheric cavity when at depth without forming folds or bubbles between the bladder and the cavity surface (normally).

A prototype version of an acoustic ALACE, named ALFOS (for ALACE and RAFOS) has also been developed by WRC and WHOI (B. Owens and J. Valdes). It is an ordinary ALACE but with a RAFOS (Bathysystems) board inside and a Benthos AQ16 hydrophone outside. One such ALFOS (serial number 02) was launched during SAMBA1. Like the first ALACE floats, ALFOS #02 had no surface anodisation, thus letting the aluminum alloy of the pressure case in direct contact with sea water (but present ALACE floats are anodized).

ALFOS #02 was programmed for 50 cycles (60 days at depth plus 2 days at surface) and to listen during 3 25-min windows beginning at 0h29min, 0h59min and 1h29min relative to UTC time at launch. Only the 2 best correlated TOAs are preserved within each of the 3 windows (MARVOR preserved 3 TOAs per window).

Althought ALFOS #02 worked well during the SAMBA0 experiment in 1992 (Ollitrault, 1993), its acoustic reception has been very poor during the SAMBA1 cycles done so far. We don't have any good explanation for its failure.

A comprehensive description of ALACE is given by Davis et al. (1992).

4.3.2 ALFOS ARGOS messages (SAMBA1)

For each daily listening phase there are 22 bytes of hexadecimal coded data : correlation heights are on 8 bits, TOAs on 16 bits, pressure and temperature on 16 bits each (they are given as frequency counts and have to be transformed into physical units during the processing).

Within each of the 3 listening windows, only the two best correlated signals are dated. The precise structure of the 22-byte string corresponding to one listening phase is given in Table 3.

Table 3 ALFOS 22-byte string format

Data	bits nº	comments
correlation height for TOA #1 TOA #1 for window #1	1 to 8 9 to 24	
correlation height for TOA #2 TOA #2 for window #1	25 to 32 33 to 48	
correlation height for TOA #1 TOA #1 for window #2	49 to 56 57 to 72	
correlation height for TOA #2 TOA #2 for window #2	73 to 80 81 to 96	
correlation height for TOA #1 TOA #1 for window #3	97 to 104 105 to 120	
correlation height for TOA #2 TOA #2 for window #3	121 to 128 129 to 144	
Temperature count Pressure count	145 to 160 161 to 176	Temperature and pressure are given by frequency counts. They have to be transformed to get physical quantities

Since ARGOS messages are 32 bytes long, the 22-byte float messages are concatenated, and the resulting bit string cut into 30-byte long pieces. At the beginning of each of the latter pieces, 2 bytes are added (the first one is a parity byte, the second one the message number) so that 32-byte ARGOS messages are obtained. Furthermore 2 extra bytes are added before the first ARGOS message (numbered 00) : a status byte indicating if the float mission was successful, and a byte giving the total number of different ARGOS messages to be sent.

For the SAMBA1 ALFOS, the 60 22 bytes corresponding to the 60 days of listening for one cycle, were emitted via 45 32-byte ARGOS messages.

To be complete, one must add that these 45 messages are scrambled prior to be sent. After reception it is easy however to descramble the messages since their serial number is given by the second byte.

Here is an example of the first messages received through Toulouse Center from ALFOS #02 at the end of its first cycle.

01108 04157 97 32 H 2 1994-04-23 05:32:45 -13.619 328.288 0.000 401649851

1994-04-23 05:26:27.336	1	58	23	F3	2B
		1A	4F	12	7D
		07	BE	20	02
		9B	1F	02	E2
		1C	3A	98	00
		02	9B	1C	3A
		98	00	3A	9A
		12	75	07	3C
1994-04-23 05:27:21.332	1	29	1F	1B	AB
		1C	3A	98	00
		3A	98	1C	3A
		98	00	3A	98
		12	75	07	B4
		1E	03	1B	1C
		3A	98	1E	36
		74	1C	3A	98
1994-04-23 05:28:15.327	1	EF	09	0D	2B
		21	02	88	20
		02	E3	22	03
		01	22	06	8C
		12	75	07	92
		1F	3A	0D	1F
		3A	48	27	30
		94	27	37	0E
1994-04-23 05:29:09.323	1	40	10	18	16
		12	75	07	98
		22	23	12	22
		32	B3	24	09
		F0	24	09	BF
		27	39	F3	27
		30	85	12	75
		07	93	26	32
1994-04-23 05:30:03.338	1	83	0C	24	38
		0E	23	35	DA
		2A	0D	93	27
		0F	2D	12	75
		07	93	20	02
		9B	1F	02	E2
		29	01	87	27
		01	30	A2	1A
1994-04-23 05:30:57.334	1	42	21	07	BD
		1E	03	1B	1C
		3A	98	1C	3A
		98	00	03	1B
		2D	1B	DF	29
		1D	2E	12	75
		07	BD	29	02
		9B	1F	02	E2

For SAMBA1, the 45 messages were sent 70 times. Since the period of emission is 54 s, it takes $70\times45\times54$ s $\approx$ 47h15min for all the messages to be sent, slightly less than 2 days.

4.3.3 ALFOS ballasting

To date, ballasting is required for all the floats, except MARVOR, so that floats stabilize near their mission depths. The best ballasting would be of course that done in sea water at temperature, density and pressure near those found by the floats in the ocean. For SAMBA1, in-situ target characteristics were T_1=4.5 °C, S_1=34.4 and p_1=800 dbar, thus ρ_1=1030.94 kg m^{-3}.

For practical reasons, ALFOS #02 ballasting was done at atmospheric pressure only, and as follows.

In the tank, at p_0 dbar, T_0 °C and ρ_0 kg m^{-3}, we have the following balance $-F = (M_0 + m_0)\,g - (V_0 + v_0)\,\rho_0 g$.

M_0 is the float mass, and m_0 the external mass added so that the float plus the external mass are negatively buoyant. V_0 is the float volume at T_0, p_0 while v_0 is the external mass volume. F is the buoyancy force (positive if upward) given by a METTLER balance. *g* is the local gravity.

At p_1, T_1 and ρ_1, the target in-situ characteristics, one must have $(M_0 + m_1)\,g - V_0\left(1 + \frac{\Delta V}{V}\right)\rho_1 g = 0$ where m_1 is the internal mass added necessary to obtain the balance. $\frac{\Delta V}{V}$ is approximated by $\alpha\Delta T + \chi\Delta p$, α and χ are the coefficients of thermal expansion and compressibility respectively :

$$\alpha = \left.\frac{1}{V}\frac{\partial V}{\partial T}\right|_p$$

$$\chi = \left.\frac{1}{V}\frac{\partial V}{\partial p}\right|_T$$

For ALACE (or ALFOS), the pressure case (6061 T-6 aluminum alloy) is approximately a circular cylinder with $\chi \approx -2.05\times10^{-6}$ dbar^{-1} and $\alpha \approx 71\times10^{-6}$ °C^{-1} (recall that compressibility of sea-water is of the order of -4.5×10^{-6} dbar^{-1}).

Accuracy of ballasting depends on several factors which are difficult to control (for example vertical temperature gradient in the ballasting tank not accounted for or small air bubbles when ballasting at atmospheric pressure).

An error of 1 g on m_1 implies a ≈15 dbar error on ALFOS depth (corresponding to an error on ρ of 0.04 kg m^{-3}, the float's volume being ≈25600 cm^3). An error of 0.1 on S implies an error on ρ of 0.08 kg m^{-3}, and an error of 0.1 °C on T gives an error of ≈0.02 kg m^{-3}. On the opposite, an error of 1 g on the float's weight in air implies an error of only a few hundredths g on m_1, which can be seen from the equation:

$$m_1 = M_0\left[\left(1 + \frac{\Delta V}{V}\right)\frac{\rho_1}{\rho_0}\right] + [\,(m_0 - v_0\rho_0) + F]\left(1 + \frac{\Delta V}{V}\right)\frac{\rho_1}{\rho_0}$$

Practical ballasting for ALFOS #02 (7 and 8 december 1993)

Weighting of ALFOS #02 in the air, with a SARTORIUS balance, gave M_0=25297 ±1 g. Then the float was put in a tank filled with distilled water at T_0=10.00 °C and S_0=0.00 ±0.01, thus ρ_0=999.7021 kg m^{-3} at p_0=0 dbar (hydrographic convention; the true absolute pressure is around 10 dbar).

With the METTLER balance, one obtained F=-121.18 g weight and $m_0 - v_0\rho_0 = 420.3$ g (by weighting the external mass in water).

Therefore

$$V_0 = (M_0 + (m_0 - v_0\rho_0) + F/g)/\rho_0 = (25297 + 420.3 - 121.2)/0.9997021 \approx 25603.7 \text{ cm}^3$$

$\Delta T = T_1 - T_0 = -5.5\,^{\circ}\mathrm{C}$ and $\Delta p = p_1 - p_0 = 800$ dbar, give

$\dfrac{\Delta V}{V} = -2.05\times10^{-6}\cdot 800 + 71\times10^{-6}\,(-5.5) \approx -2030\times10^{-6}$ and finally,

$$m_1 = V_0\left(1 + \frac{\Delta V}{V}\right)\rho_1 - M_0 = 25603.7\,(1 - 2030\times10^{-6})\cdot 1.03094 - 25297 \approx 1045.3 \text{ g}.$$

This is the mass added inside the float, and this completes the ballasting.

4.4 VCM float

4.4.1 Generalities

The Vertical Current Measuring (VCM) float is a prototype Rafos type float developed by SEASCAN (P. Tillier). It is a one-shot float, like ordinary RAFOS, which drops a weight at the end of its mission to surface and relay to ARGOS the data gathered at depth. Besides, it can also measure relative vertical water motions by counting the number of turns of a propeller fixed to the float pressure case (which is similar to that of ALACE). The VCM has an overall length of 1.73 m and a mass of ≈23 kg (Fig. 9). The temperature and pressure sensors and acquisition board are exactly the same as for MARVOR. For the SAMBA1 experiment, pressure (dbar), temperature (1/100 °C), and number of half-turn accumulated were sampled every 8 h, and stored with 11 bits (thus over 0-2047). Listening windows 25 min wide were opened at 0^h29, 0^h59 and 1^h29 relative to UTC, but only the best correlated signal in each window was stored (correlation height on 2 bits, TOA on 12 bits).

When water is upwelling relative to the float, the rotation is direct (i.e. anti clockwise) and the number of half-turn diminishes; and vice versa. Float diameter is 17.5 cm while outer diameter of the propeller is 44.5 cm. Blades are inclined with a 45° angle to the vertical, but are planar, which is not a good hydrodynamical design, since the vertical motion implied by one turn of the float, would correspond to roughly 50 cm or to 140 cm wether we consider the inner propeller diameter or the outer diameter (during the SAMBA0 experiment, west of Portugal, in May 1992, one VCM turned, on sinking, by 2000 1/2 turns corresponding with 1050 dbar measured and a time of 105 min to reach that depth from the surface). Some very rough calibration of the VCM prior to its deployment at sea was done: we let the float gently sink in the IFREMER seawater facility tank which is 8 m deep and we measured about 7 turns of the float. We then pulled up the float back to the surface with a thin rope attached at the top of the antenna and we measured between 7.5 and 8 turns.

The place where the rotation vane is attached is also a point of concern as far as the hydrodynamical behaviour of the float is concerned. Before launching, we fixed it roughly equidistant between top and bottom of the float case, but of course we did that. We can also add that the center of mass is approximately more or less coaxial with the center of drag, but we have not done any measurement of all these important things. Consequently we should be very cautious when interpreting the vertical velocity measurements.

SAMBA1 VCM #19 mission started on February 23 1994 (day 54) at 23h23 UT to acquire 548 daily phases (days 55 to 602). The float was put into water on February 24 1994 at 11h04 UT, with a drop of its ballast weight (providing a ≈1 kg positive buoyancy) scheduled on August 25 1995 at 16h05 UT. Prior to launch the float clock was reset with a GPS reference (on day 46) and check on day 54 when starting the mission (0.06 s late). Pressure measurements given by the SEASCAN board at atmospheric pressure, revealed an instability at 0 pressure (relative to 1 bar) of the acquisition system (probably the PAINE transducer) with variations within +4 dbar and -11 dbar (temperature measurements varied between 24.62 °C and 24.85 °C). The same problem was noted with the 20 MARVORs. This is discussed in Section 4.7.

4.4.2 VCM ARGOS messages (SAMBA1)

There is one 256-bit ARGOS message for each daily listening phase at depth, but only the first 160 bits are used (the remaining ones are set to 0).

Information is hexadecimal coded and messages retransmitted from Toulouse consist of 32 bytes. The precise ARGOS message structure is as follows.

Table 4 VCM float ARGOS message structure

Data	bits nº	comments
phase number	1 to 11	first phase is numbered 0
pressure	12 to 22	measured at 0h00 UT
temperature	23 to 33	
number of 1/2 turns	34 to 44	
correlation height for window #1	45 to 46	
TOA for window #1	47 to 58	
correlation height for window #2	59 to 60	
TOA for window #2	61 to 72	
correlation height for window #3	73 to 74	
TOA for window #3	75 to 86	
pressure	87 to 97	measured at 8h00 UT
temperature	98 to 108	
number of 1/2 turns	109 to 119	
pressure	120 to 130	measured at16h00 UT
temperature	131 to 141	
number of 1/2 turns	142 to 152	
checksum	153 to 160	

Here is an example of the first messages received from VCM #19.

01108 04162 121 32

1995-08-25 16:53:44.065	1	0B	4D	E8	C0
		88	A3	E4	12
		44	2A	89	BF
		18	21	02	DE
		CB	E8	5A	03
		00	00	00	00
		00	00	00	00
		00	00	00	00
1995-08-25 16:54:30.053	1	10	EE	38	C0
		79	D4	45	C9
		89	45	89	C6
		98	1F	56	E3
		4C	0F	A1	A6
		00	00	00	00
		00	00	00	00
		00	00	00	00
1995-08-25 16:55:16.040	1	16	8E	6C	BF
		57	A4	65	9C
		0D	1D	91	CD
		97	BB	10	E8
		4B	C5	A0	B3
		00	00	00	00
		00	00	00	00
		00	00	00	00
1995-08-25 16:56:02.027	1	1C	2E	AC	BC
		4E	82	8F	CE
		F3	4E	75	D5
		97	C9	DC	EB
		4B	B4	F0	80
		00	00	00	00
		00	00	00	00
		00	00	00	00
1995-08-25 16:56:47.995	1	21	CE	EC	BF
		BD	70	60	31
		06	2C	29	DF
		97	A7	88	F0
		0B	EB	D8	EA
		00	00	00	00
		00	00	00	00
		00	00	00	00
1995-08-25 16:57:33.982	1	27	6F	2C	BB
		A9	74	A4	4F
		F2	62	A5	E2
		97	44	EC	F2
		0B	BA	7A	20
		00	00	00	00
		00	00	00	00
		00	00	00	00
1995-08-25 16:58:19.970	1	2D	0F	28	BB
		A5	71	02	94
		90	70	ED	E5
		97	74	B6	F2
		8B	D2	53	00
		00	00	00	00
		00	00	00	00

Messages were sent by the float in packets of 12 messages, each packet being repeated for 5h59min (there is one minute blank between two different packets). Furthermore, similarly to the MARVOR and ALFOS, messages were distributed evenly over the packets in order to avoid a large hole in the data time series. In fact, messages were emitted as follows :

packet #1 messages# 00, 45, 90, 135, 180, 225, 270, 315, 360, 405, 450, 495.
packet #2 messages# 01, 45, 91, 136, 181, 226, 271, 316, 361, 406, 451, 496.
⋮ ⋮
packet #45 messages# 44, 89, 134, 179, 224, 269, 314, 360, 404, 449, 494, 539.

Actually the VCM transmitted 540 messages, although it acquired 548 days of data at depth. In fact, when we programmed the VCM mission we forgot to check for an entire division of the number of messages by 12. The last 8 days of data have unfortunately been lost.

Practical ballasting for VCM #19 (8 and 9december 1994)

Ballasting of the VCM #19 was done exactly along the same lines as for ALFOS #02.

Weighting of VCM #19 in the air, with a SARTORIUS balance, gave M_0=23020 ±1 g. The float was then put in a tank filled with distilled water at T_0=10.70 ±0.05 °C and S_0=0.00 ±0.01, thus ρ_0=999.6372 kg m^{-3} at p_0=0 dbar (hydrographic convention).

With the METTLER balance, one obtained F=-210.6 g weight (without adding an external mass).

Therefore,

$$V_0 = (M_0 + F/g)/\rho_0 = (23020 - 210.6)/0.9996372 \approx 22817.7 \text{ cm}^3$$

$\Delta T = T_1 - T_0 = -6.2$ °C and $\Delta p = p_1 - p_0 = 800$ dbar, give

$$\frac{\Delta V}{V} = -2.05\times10^{-6} \cdot 800 + 71\times10^{-6}(-6.2) \approx -2080\times10^{-6}$$ and finally,

$$m_1 = V_0\left(1 + \frac{\Delta V}{V}\right)\rho_1 - M_0 = 22817.7\,(1 - 2080\times10^{-6}) \cdot 1.03094 - 23020 \approx 454.7 \text{ g}.$$

This is the mass added inside the float, and this completes the ballasting.

4.5 Float data processing

The ASCII files on 3.5" diskettes, received monthly from ARGOS processing center, contain all the messages received from all the emitting floats during the previous month.

They also contain on-surface positions calculated by system ARGOS. ARGOS surface position obtained during a satellite pass over an emitting float PTT, is given on the first line preceding the float messages proper received by the satellite (see the examples given in Sections 4.2.5 and 4.3.2 or 4.4.2).

On-surface ARGOS positions and float messages corresponding to the different floats are first sorted out.

- Processing of ARGOS positions is straightforward. Plotting the successive ARGOS positions reveals a few bad positions corresponding to localisation classes 0, A, B or Z. They have generally been suppressed and only positions with classes 1, 2 or 3 preserved, for which ARGOS assumes an accuracy better than 1 km. For each float and each on-surface period a so called .diaric file is finally created. The FLOATER format (see Appendix A) is used for this on-surface position file.
- Processing of float messages proper is much more complicated.

Generally there are several messages received corresponding to the same original message emitted by the float. In that case, if at least 2 messages received are identical, all the other differing ones are cleared out. That is, we rely on multiple receptions and select the most common messages. Then we select the TOAs that seem to correspond to a given sound source. The final selection files are called .sel. There is one file for one float and one cycle.

Furthermore, at this stage but for the ALFOS only, pressure and temperature are calculated in physical units from the frequency counts n and N, given in the ARGOS message (for MARVOR and VCM, T and P are already given in physical units in ARGOS messages). The temperature in 0.01 °C is given by $T = A + BX + CX^2 + DX^3 + EX^4$ with $X = \frac{n}{1000.}$ and the pressure P in dbar is given by $P = \tilde{A} + \tilde{B}Z$ with $Z = \frac{N - 1000.}{1000.}$ and $\tilde{A} = A_0 + A_1X$, $\tilde{B} = B_0 + B_1X$.

Calibrations for the ALFOS #02 were done at IFREMER metrology Lab by Martine Cambon in January and February 1993 (Appendix F). The least square fitted resulting coefficients are given in Appendix F.

In fact, temperature and pressure given by the SEASCAN board (for MARVOR or VCM) are also calculated along the same lines. Precisely T is obtained from $A + BX + CX^2 + DX^3$ with $X = \frac{n}{1000.}$ and P from $\tilde{A} + \tilde{B}Z$ with $Z = \frac{N}{1000.}$ and $\tilde{A} = A_0 + A_1X$, $\tilde{B} = B_0 + B_1X$.

The coefficients A, B, C, D, A_0, A_1, B_0 and B_1 put in the microprocessor memories of the 20 MARVORs and VCM float of SAMBA1 are given in Table F6 of Appendix F. Calibrations for MARVOR and VCM floats were done by SEASCAN, but we made a check at IFREMER metrology Lab for 2 MARVORs and VCM #19 (Appendix F).

Raw position estimation

From the .sel file for a given float, position files (named .pos files) are obtained by a least square minimization on the propagation time residuals using constant speeds of sound but possibly different for different sound sources. That is one minimizes the expression $\sum r_i^2$ where $\boxed{r_i = T_i\text{prop model} - T_i\text{prop measured}}$ is the propagation time residual for source n°i and $T_i$prop model is given by $\dfrac{\text{distance(float, sound source n°i)}}{\text{assumed speed of sound}}$.

Since MARVOR clock advances are monitored to within ± 0.015 s when the float is at the surface at the end of each cycle and since the drift is quasi-linear over the 60-day cycles of SAMBA1 (see Table 8), the TOAs were first edited of the clock advance with a linear drift assumed between the advances at the beginning and end of a cycle. For the MARVOR floats, TOAs are thus assumed accurate to within ± 0.05 s. Consequently, the float clock advances for the MARVORs have not been least square estimated. Had we not known the float advances, we would have estimated it with $r_i = T_i\text{prop model} - T_i\text{prop measured} + \text{float clock advance}$.

We have done so with the VCM, because it doesn't transmit its time.

The ALFOS doesn't transmit its time directly, but we know the time scheduled for its first ARGOS emission, with a few deciseconds accuracy. We could thus have edited its TOAs along the same lines as for the MARVORs. However, acoustic reception on ALFOS #02 proved so bad that we have not used the TOA data (see also Section 4.7).

As many sources and of as good geometrical distribution as possible are used during a first iteration to check for outliers corresponding to erroneous signals. Then a second iteration will give a better trajectory by using only the 2 best geometrically distributed sources (that is to say sources seen from the float point of view as situated 90° apart). Using this procedure, we have been able to track almost all the SAMBA1 MARVOR float data with an assumed accuracy of a few kilometers since residuals only on very rare occasions exceeded a few seconds (1 s time corresponding naturally to 1.5 km distance). Tracking of the VCM is probably slightly less accurate, due to the imperfect knowledge of its clock behaviour. That accuracy has been obtained mainly by using a precise sound speed atlas designed specifically for the SAMBA1 floats and sound source array. More precisely, sound speed vertical profiles have been obtained first from the 33-level T and S mean annual values of the Levitus atlas (Levitus, 1982), thus in each 1° lat × 1° long box. Then a ray tracing (geometrical acoustics) program has allowed us to obtain the mean speeds of sound between an imaginary float (situated at 800 m depth and at given integral latitudes and longitudes) and the various sound sources. In fact, the propagation time of the ray with the largest amplitude has been used. The precise estimation of the distances between a float and the sound sources is given by the Andoyer (1934) formula applied on a reference ellipsoid with semi major axis a=6377.0 km and flattening f=1/298.25 (Ollitrault, 1987).

Table E1 in Appendix E give, the mean speeds of sound thus obtained (on a 2° latitude by 5° longitude grid) with the 19 sound source nominal locations and depths. The reader may be confused at this point since we explained above that .pos (raw position) files were obtained from constant speeds of sound and as soon as a float moves along more than a few degrees, the mean speeds of sound to be used for adequate tracking may change, at least slightly. In fact, due to the limited time of the cycles (2 or 3 months) it is safe to assume, for a given float and cycle, constant speeds of sound relative to given sources.

It is also necessary to correct the times of propagation for sound source clock drifts. WHOI sound sources were recovered in Spring 1995 and their clock advances obtained (Appendix D). In that case, a linear drift is assumed between advances at mooring and at recovery. For the other sources still in water, it is desirable to be able to monitor the behaviour of their clocks, even approximately. That has been done as follows. MARVOR first ARGOS surface position (accuracy ± 1000 m), available generally a few hours after the float surfacing, is supposed to approximate the last deep float position (MARVOR takes slightly less than 3 h to rise from 800 dbar). Comparing the times of propagation from the different sources with the theoretical ones (obtained from the mean sound speed given by the atlas and the distances between the surface float position and source positions) one obtains estimates of the source clock advances[1]. This procedure has given advances in agreement with directly measured advances (from WHOI sources) within ± 3 s generally (see also Section 4.7). It is probably difficult to do better at present, because of an intrinsic inadequate resolution of float correlators (only TOAs separated by more than 2 s are preserved by MARVORs and the VCM).

One last point of caution concerns the time used to set the float and source clocks. Generally they are set by UTC, but we recall that generally once per year, 1 leap second is added to UTC as compared to TAI (Appendix B). Therefore if one uses several sound sources whose time has been set with UTC but possibly with a different number of leap seconds (for example source K1 set before 1/07/1993 and source KB set after 1/07/1993), one must refer all times to a common reference.

The natural uniform time that can be used is TAI but only during the processing phase in the laboratory.

For example, the K1 sound source already mentionned has been set on 11/12/1992 and emits daily at 1h30 UTC, while KB has been set on 2/06/1994 and emits daily at 1h35 UTC. Suppose one wants to track with these 2 sound sources a RAFOS float launched on 15/06/1992, whose clock has been set with UTC just prior to launching.

One way to proceed now, is to define the K1 and KB daily times of emission as 1h30m27s and 1h35m28s respectively. Then one is able to determine a float "clock advance" (>0 if early, <0 if late) that should be of the order of -26 s, had the float clock not drifted. One can also of course redefine the times of the listening windows of the float using TAI, implying a float "clock advance" near 0 s, had the float clock been perfect. The SAMBA1 MARVOR and VCM floats have been processed this way.

For a given float and cycle, several trajectories may have been obtained, each one corresponding to a given pair of sources. After a check for continuity (within a few km) and for consistency of float velocities (same order at the end of the trajectory nºk, and at beginning of trajectory nºk+1), the retained trajectories were matched together, leading in principle to a final and unique trajectory for a given cycle.

Summaries of these final raw data files named .raw (which contain in our opinion the "best" raw positions) are given in Table 5. FLOATER format defined by WHOI (see Appendix A) is used for these position files, which constitute the SAMBA1 float raw data for any subsequent analysis (filtered position files will also use FLOATER format).

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1. We could have proceeded similarly to check for the VCM clock advance estimated by least squares, at the last position at depth (which should correspond to the first ARGOS surface position). Unfortunately, as mentionned in Section 4.4.2, the last 8 days of data were not transmitted !

Table 5 Summary of raw position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m101-c1.raw	94/ 2/19	94/ 4/19	26°38.94'S	36°19.44'W	26° 0.84'S	38°44.04'W	4.75	5.11	803.	815.	59	60
m101-c2.raw	94/ 4/22	94/ 6/20	26° 6.00'S	38°51.54'W	26°13.08'S	41°21.78'W	5.00	5.28	785.	795.	47	60
m101-c3.raw	94/ 6/23	94/ 8/21	26°15.84'S	41°17.34'W	27°56.40'S	42° 3.96'W	4.83	5.09	793.	799.	52	60
m101-c4.raw	94/ 8/24	94/10/22	28° 4.14'S	41°52.44'W	26°47.70'S	44°17.94'W	4.87	5.44	821.	830.	48	60
m101-c5.raw	94/10/25	94/12/23	27° 4.92'S	44°32.82'W	25° 6.06'S	44° 9.36'W	4.73	5.73	796.	804.	44	60
m101-c6.raw	94/12/26	95/ 2/13	25°16.20'S	44°30.90'W	22°28.14'S	40° 7.50'W	3.32	5.27	799.	1565.	43	60
m101-c7.raw	95/ 2/26	95/ 4/26	22°26.22'S	39°26.16'W	23°28.68'S	40°46.50'W	4.51	5.24	810.	815.	56	60
m101-c8.raw	95/ 4/29	95/ 6/26	23°59.82'S	41°15.24'W	19° 9.18'S	37°52.32'W	4.09	5.45	728.	815.	41	60
m101-c9.raw	95/ 8/ 2	95/ 8/28	20° 1.68'S	38°25.26'W	19°34.62'S	37°38.16'W	4.19	5.36	750.	815.	25	60
m102-c1.raw	94/ 2/19	94/ 4/19	26°20.46'S	36°19.56'W	26°13.50'S	38°38.52'W	4.72	5.04	800.	814.	59	60
m102-c2.raw	94/ 4/22	94/ 6/20	26°14.28'S	39° 1.92'W	26° 7.08'S	41°43.02'W	4.83	5.11	793.	801.	50	60
m102-c3.raw	94/ 6/23	94/ 8/21	26° 8.46'S	41°48.60'W	26°51.90'S	43°13.68'W	4.89	5.26	801.	809.	58	60
m102-c4.raw	94/ 8/24	94/10/22	27°27.06'S	42°54.06'W	25°55.20'S	43°53.34'W	4.42	5.29	806.	900.	49	60
m102-c5.raw	94/10/25	94/12/23	26° 0.42'S	44°10.20'W	24°56.88'S	42°26.76'W	4.13	5.08	805.	856.	48	60
m102-c6.raw	94/12/26	95/ 2/23	24°35.88'S	43°17.58'W	25°12.18'S	44°25.62'W	4.13	5.40	779.	861.	54	60
m102-c7.raw	95/ 2/26	95/ 4/26	25°37.98'S	44°59.76'W	24°30.24'S	43°13.38'W	3.27	4.75	809.	1556.	34	60
m102-c8.raw	95/ 4/29	95/ 6/27	24°18.06'S	42°29.22'W	26°55.02'S	45°30.18'W	3.70	5.08	770.	1030.	60	60
m102-c9.raw	95/ 6/30	95/ 8/28	27° 0.36'S	45°38.94'W	24°14.16'S	43° 5.28'W	3.99	5.17	817.	866.	59	60
m103-c1.raw	94/ 2/19	94/ 4/19	26°30.06'S	36° 8.46'W	26° 4.08'S	38° 1.02'W	4.38	4.99	810.	837.	58	60
m103-c2.raw	94/ 4/22	94/ 6/17	26° 1.08'S	37°59.64'W	26°30.48'S	38°49.68'W	4.80	4.95	784.	792.	50	60
m103-c3.raw	94/ 6/23	94/ 8/21	26°48.18'S	39° 7.50'W	26°45.48'S	40°10.50'W	4.96	5.13	788.	792.	59	60
m103-c4.raw	94/ 8/24	94/10/22	26°44.40'S	40°14.04'W	28°34.14'S	41°59.82'W	5.01	5.51	794.	799.	56	60
m103-c5.raw	94/10/25	94/12/23	28°45.36'S	42°20.58'W	28°49.02'S	45°59.76'W	5.34	5.93	802.	816.	49	60
m103-c6.raw	94/12/26	95/ 2/23	28°47.82'S	46°17.04'W	32°31.50'S	49°46.20'W	5.11	5.95	791.	809.	51	60
m104-c1.raw	94/ 2/19	94/ 4/19	26°37.80'S	35°57.90'W	26°10.50'S	36°59.22'W	4.41	4.98	798.	810.	57	60
m104-c2.raw	94/ 4/22	94/ 6/20	26°20.82'S	37° 8.28'W	26°58.68'S	37°52.68'W	4.59	4.90	797.	803.	57	60
m104-c3.raw	94/ 6/23	94/ 8/21	27° 5.52'S	37°54.36'W	26°49.56'S	38°29.34'W	4.50	4.75	818.	822.	54	60
m104-c4.raw	94/ 8/24	94/10/22	27° 0.42'S	38°30.12'W	26°39.54'S	38°29.58'W	4.71	4.92	780.	786.	49	60
m104-c5.raw	94/10/25	94/12/23	26°48.18'S	38° 7.92'W	28°10.50'S	39°13.74'W	4.49	5.03	798.	809.	48	60
m104-c6.raw	94/12/26	95/ 2/23	28°19.98'S	39°41.16'W	29°13.08'S	43°14.46'W	5.04	5.26	789.	793.	60	60

Table 5 Summary of raw position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m104-c7.raw	95/ 2/26	95/ 4/26	29°30.24'S	43°14.52'W	31° 5.46'S	45°30.66'W	4.89	5.40	813.	817.	57	60
m104-c8.raw	95/ 4/29	95/ 6/27	31°13.08'S	45°20.82'W	30°50.22'S	46°32.46'W	4.98	5.60	796.	810.	60	60
m104-c9.raw	95/ 6/30	95/ 8/28	30°53.16'S	46°54.12'W	31°35.04'S	48°26.16'W	4.83	5.73	800.	818.	58	60
m105-c1.raw	94/ 2/19	94/ 4/19	26°19.20'S	35°56.64'W	25°59.88'S	36°40.50'W	4.49	5.11	805.	839.	60	60
m105-c2.raw	94/ 4/22	94/ 6/20	26° 6.18'S	36°53.94'W	26°43.92'S	37°49.98'W	4.87	5.09	798.	812.	57	60
m105-c3.raw	94/ 6/23	94/ 8/18	26°55.38'S	37°55.08'W	26°42.54'S	38°53.34'W	4.99	5.20	801.	817.	55	60
m105-c4.raw	94/ 8/24	94/10/22	26°43.08'S	38°50.34'W	26° 9.24'S	38°58.50'W	4.84	5.19	798.	823.	49	60
m105-c5.raw	94/10/25	94/12/21	26°12.48'S	38°42.66'W	25°27.66'S	38°24.24'W	4.67	5.26	790.	823.	54	60
m105-c6.raw	94/12/26	95/ 2/23	25°26.88'S	38°12.78'W	25°17.70'S	38°47.04'W	4.38	4.89	792.	839.	56	60
m105-c7.raw	95/ 2/26	95/ 4/26	25°24.48'S	38°39.60'W	25°57.06'S	38°54.48'W	4.51	4.96	794.	822.	59	60
m105-c8.raw	95/ 4/29	95/ 6/27	25°39.06'S	38°50.04'W	25°50.70'S	41° 9.66'W	4.61	4.84	793.	841.	60	60
m105-c9.raw	95/ 6/30	95/ 8/28	25°58.56'S	41°24.30'W	25°51.24'S	41° 2.40'W	4.71	5.23	792.	844.	60	60
m106-c1.raw	94/ 2/20	94/ 4/20	22°40.50'S	32°59.52'W	23°34.98'S	34°28.86'W	4.47	4.68	803.	826.	58	60
m106-c2.raw	94/ 4/23	94/ 6/21	23°48.30'S	34°37.14'W	23°36.96'S	34°28.80'W	4.49	4.97	798.	809.	55	60
m106-c3.raw	94/ 6/24	94/ 8/22	23°46.02'S	34°32.64'W	25°11.16'S	35°30.42'W	4.62	5.12	800.	808.	59	60
m106-c4.raw	94/ 8/25	94/10/23	25°16.02'S	35°13.32'W	24° 4.80'S	36° 0.48'W	4.67	5.23	787.	812.	53	60
m106-c5.raw	94/10/26	94/12/24	24°12.42'S	35°42.84'W	24°52.86'S	35° 8.76'W	4.57	4.83	795.	814.	53	60
m106-c6.raw	94/12/27	95/ 2/24	25° 4.44'S	34°34.38'W	25°11.88'S	35°31.02'W	4.59	4.90	785.	814.	60	60
m106-c7.raw	95/ 2/27	95/ 4/27	25°19.50'S	35°19.14'W	24°30.42'S	36°12.00'W	4.15	4.71	802.	861.	60	60
m106-c8.raw	95/ 4/30	95/ 6/28	24°18.36'S	36°25.50'W	22°45.84'S	36° 9.30'W	4.44	4.86	790.	823.	59	60
m106-c9.raw	95/ 7/ 1	95/ 8/29	23° 1.26'S	36°49.74'W	23°22.74'S	38°31.14'W	4.30	5.29	796.	886.	59	60
m107-c1.raw	94/ 2/22	94/ 4/21	22°21.84'S	33° 7.50'W	21°47.64'S	34°26.58'W	4.41	4.60	793.	804.	52	60
m107-c2.raw	94/ 4/24	94/ 6/22	21°55.92'S	34°35.58'W	22°51.42'S	37°42.60'W	4.50	4.74	798.	807.	59	60
m107-c3.raw	94/ 6/25	94/ 8/23	22°52.98'S	37°40.38'W	23°22.20'S	38° 8.52'W	4.87	5.03	791.	804.	58	60
m107-c4.raw	94/ 8/26	94/10/24	23°21.18'S	38° 0.96'W	23° 5.94'S	37°41.76'W	4.42	5.01	803.	818.	59	60
m107-c5.raw	94/10/27	94/12/25	23°16.74'S	37°37.56'W	23°26.76'S	39°30.60'W	4.58	4.85	796.	808.	50	60
m107-c6.raw	94/12/28	95/ 2/25	23°39.66'S	39°43.20'W	24° 9.00'S	39°25.20'W	4.86	5.35	796.	808.	60	60
m107-c7.raw	95/ 2/28	95/ 4/28	24°24.36'S	39° 3.00'W	25°46.14'S	39° 9.78'W	4.61	4.81	807.	815.	60	60
m107-c8.raw	95/ 5/ 1	95/ 6/29	25°58.86'S	39° 5.88'W	26° 7.44'S	39°16.14'W	4.57	4.85	799.	813.	60	60
m107-c9.raw	95/ 7/ 2	95/ 8/30	26° 9.42'S	39°16.32'W	27° 3.18'S	39°14.94'W	4.74	4.91	811.	822.	60	60

Table 5 Summary of raw position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m108-c1.raw	94/ 2/22	94/ 4/21	22°30.18'S	32°55.50'W	21°43.92'S	34°15.12'W	4.28	4.46	816.	827.	56	60
m108-c2.raw	94/ 4/24	94/ 6/22	21°51.24'S	34°28.92'W	22°39.12'S	37°42.42'W	4.43	4.67	805.	815.	50	60
m108-c3.raw	94/ 6/25	94/ 8/23	22°40.20'S	37°43.92'W	23° 5.46'S	38°28.08'W	4.66	4.81	807.	815.	59	60
m108-c4.raw	94/ 8/26	94/10/24	23° 2.52'S	38°25.62'W	23° 7.86'S	39°29.46'W	4.61	5.09	798.	835.	58	60
m108-c5.raw	94/10/27	94/12/25	23°23.46'S	39°37.68'W	22°15.90'S	39°43.02'W	4.47	5.07	792.	807.	51	60
m108-c6.raw	94/12/28	95/ 2/25	23°15.18'S	39°42.72'W	19°53.10'S	37°30.84'W	3.91	5.47	787.	826.	41	60
m108-c7.raw	95/ 2/28	95/ 4/28	20° 6.42'S	37°25.86'W	16° 6.90'S	36°18.30'W	3.90	5.37	779.	831.	32	60
m108-c8.raw	95/ 5/ 1	95/ 6/27	15°51.78'S	36°34.20'W	13°11.94'S	38°22.26'W	3.93	5.40	796.	899.	19	60
m109-c1.raw	94/ 2/21	94/ 4/21	22°38.58'S	32°40.20'W	21°34.08'S	34°24.54'W	4.22	4.29	815.	826.	57	60
m109-c2.raw	94/ 4/24	94/ 6/22	21°42.60'S	34°41.52'W	22°54.72'S	37°30.12'W	4.33	4.55	797.	811.	56	60
m109-c3.raw	94/ 6/25	94/ 8/23	22°54.96'S	37°33.60'W	23°18.12'S	38° 6.78'W	4.58	4.74	812.	822.	59	60
m109-c4.raw	94/ 8/26	94/10/24	23°15.90'S	38° 3.84'W	23°15.84'S	37°55.86'W	4.60	4.89	796.	805.	56	60
m109-c5.raw	94/10/27	94/12/25	23°30.18'S	37°51.24'W	23°45.36'S	37°50.76'W	4.89	5.15	785.	797.	57	60
m109-c6.raw	94/12/28	95/ 2/25	23°54.18'S	37°26.64'W	23°47.16'S	38°12.42'W	4.69	4.99	801.	813.	60	60
m109-c7.raw	95/ 2/28	95/ 4/28	24° 5.64'S	37°54.78'W	23°22.26'S	38°50.34'W	4.64	5.06	806.	816.	60	60
m109-c8.raw	95/ 5/ 1	95/ 6/29	23°26.16'S	39° 2.64'W	24°39.12'S	39°23.52'W	4.57	4.97	803.	814.	60	60
m109-c9.raw	95/ 7/ 2	95/ 8/30	24°33.72'S	39°19.56'W	24°22.86'S	40°36.30'W	4.45	4.84	799.	816.	60	60
m110-c1.raw	94/ 2/21	94/ 4/21	22°19.14'S	32°43.14'W	21°42.36'S	34°45.36'W	4.39	4.60	801.	815.	56	60
m110-c2.raw	94/ 4/24	94/ 6/22	21°56.70'S	34°58.50'W	22°46.92'S	36°42.30'W	4.62	4.75	784.	797.	50	60
m110-c3.raw	94/ 6/25	94/ 8/23	22°55.86'S	36°37.86'W	22°28.56'S	36°57.66'W	4.64	4.98	791.	802.	60	60
m110-c4.raw	94/ 8/26	94/10/24	22°46.50'S	36°51.36'W	24°21.06'S	38°40.62'W	4.36	4.97	790.	842.	54	60
m110-c5.raw	94/10/27	94/12/25	24°52.14'S	38°48.12'W	25°26.34'S	41°22.74'W	4.72	5.01	803.	836.	58	60
m110-c6.raw	94/12/28	95/ 2/25	25°43.14'S	41°19.56'W	26° 6.24'S	42° 3.96'W	5.01	5.30	793.	807.	58	60
m110-c7.raw	95/ 2/28	95/ 4/28	25°47.16'S	41°30.00'W	25°18.48'S	41°16.50'W	2.99	5.24	819.	2632.	57	60
m110-c8.raw	95/ 5/ 1	95/ 6/29	25°15.54'S	41°12.42'W	25°24.18'S	43° 2.76'W	3.31	5.03	816.	1389.	59	60
m110-c9.raw	95/ 7/ 2	95/ 8/ 3	25°29.58'S	43°22.44'W	25° 0.42'S	43°51.66'W	3.36	5.21	805.	1930.	27	60
m111-c1.raw	94/ 2/22	94/ 4/21	18°41.40'S	31°23.52'W	19°29.22'S	29°23.22'W	3.92	4.15	809.	827.	26	60
m111-c2.raw	94/ 4/25	94/ 6/22	19°29.76'S	29°16.56'W	18°17.16'S	27°35.94'W	3.96	4.07	810.	821.	29	60
m111-c3.raw	94/ 6/28	94/ 8/24	18°20.58'S	27°35.28'W	19°37.14'S	25°52.50'W	4.02	4.16	795.	805.	47	60
m111-c4.raw	94/ 8/27	94/10/25	19°45.42'S	26° 0.66'W	19°52.62'S	24° 0.66'W	4.09	4.23	801.	812.	51	60

Table 5 Summary of raw position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m111-c5.raw	94/10/28	94/12/26	19°58.56'S	24°13.02'W	20°34.26'S	24°38.40'W	4.07	4.18	806.	818.	38	60
m111-c6.raw	94/12/30	95/ 2/26	20°52.80'S	24°50.40'W	20°43.68'S	24°10.98'W	3.93	4.41	790.	887.	44	60
m111-c7.raw	95/ 3/ 1	95/ 4/29	20°41.34'S	24°10.62'W	19°34.68'S	23° 8.52'W	3.86	4.39	799.	899.	53	60
m111-c8.raw	95/ 5/ 2	95/ 6/30	19°33.42'S	23°11.58'W	19°43.98'S	20° 4.80'W	3.76	4.38	796.	881.	60	60
m111-c9.raw	95/ 7/ 3	95/ 8/31	19°44.16'S	20°10.26'W	19°41.28'S	18°42.12'W	3.79	4.14	796.	873.	59	60
m112-c1.raw	94/ 2/22	94/ 4/19	18°29.88'S	31°40.02'W	18°34.44'S	33°43.20'W	4.26	4.34	789.	800.	24	60
m112-c2.raw	94/ 4/25	94/ 6/22	18°24.18'S	34° 5.82'W	17°59.88'S	33°45.18'W	4.23	4.39	782.	787.	20	60
m112-c3.raw	94/ 6/28	94/ 8/24	18°17.34'S	33°36.54'W	17°46.56'S	34° 7.32'W	4.12	4.27	779.	786.	32	60
m112-c4.raw	94/ 8/27	94/10/24	17°37.68'S	34°16.86'W	19°16.62'S	35°59.22'W	4.03	4.21	790.	800.	16	60
m112-c5.raw	94/10/30	94/12/26	19°31.14'S	35°48.54'W	17°28.26'S	36°46.08'W	4.09	4.51	789.	796.	12	60
m112-c6.raw	94/12/29	95/ 2/26	17°24.66'S	37° 2.64'W	13° 9.54'S	38° 4.56'W	3.83	4.84	796.	814.	8	60
m112-c7.raw	95/ 3/ 4	95/ 4/29	12°50.58'S	37°40.50'W	4°41.40'S	34°56.70'W	4.17	4.90	784.	840.	49	60
m112-c8.raw	95/ 5/ 2	95/ 6/30	4° 2.76'S	36°27.12'W	2°29.82'S	38°48.90'W	4.12	4.78	768.	780.	51	60
m112-c9.raw	95/ 7/ 3	95/ 8/30	1°40.32'S	41°36.36'W	1°48.36'S	42°49.14'W	4.44	5.19	779.	813.	32	60
m113-c1.raw	94/ 2/22	94/ 4/21	18°26.16'S	31°26.16'W	18°31.26'S	31°25.80'W	4.00	4.19	799.	819.	28	60
m113-c2.raw	94/ 4/25	94/ 6/22	18°43.98'S	31°25.80'W	18°59.70'S	28°50.46'W	4.01	4.14	807.	817.	27	60
m113-c3.raw	94/ 6/26	94/ 8/23	19°14.04'S	28°52.92'W	19°48.06'S	27°29.94'W	4.08	4.13	804.	830.	29	60
m113-c4.raw	94/ 8/27	94/10/25	19°55.56'S	27°28.68'W	20°24.36'S	27° 4.20'W	3.77	4.24	807.	910.	60	60
m113-c5.raw	94/10/28	94/12/26	20°35.46'S	27°13.56'W	21° 8.70'S	26°10.68'W	4.35	4.42	790.	798.	58	60
m113-c6.raw	94/12/29	95/ 2/26	21°14.16'S	26°26.52'W	21°44.40'S	25°52.02'W	3.68	4.34	823.	967.	57	60
m113-c7.raw	95/ 3/ 1	95/ 4/29	21°35.46'S	26° 5.40'W	22° 2.22'S	25°39.78'W	4.37	4.64	788.	801.	52	60
m113-c8.raw	95/ 5/ 2	95/ 6/30	22°11.76'S	25°31.68'W	22°20.58'S	24°53.82'W	4.42	4.54	798.	807.	57	60
m113-c9.raw	95/ 7/ 3	95/ 8/31	22° 8.34'S	25°13.38'W	22°28.56'S	27°46.20'W	4.32	4.58	805.	814.	57	60
m114-c1.raw	94/ 2/22	94/ 4/21	18°27.00'S	31° 9.66'W	19°22.98'S	29°32.82'W	3.92	4.01	799.	813.	29	60
m114-c2.raw	94/ 4/25	94/ 6/22	19°27.72'S	29°31.14'W	18°18.96'S	27°38.10'W	3.97	4.15	782.	791.	27	60
m114-c3.raw	94/ 6/26	94/ 8/24	18°24.18'S	27°45.54'W	18°37.20'S	26°17.94'W	3.96	4.06	791.	797.	51	60
m114-c4.raw	94/ 8/27	94/10/24	18°39.84'S	26°28.32'W	18°14.70'S	28° 2.58'W	4.01	4.08	784.	791.	28	60
m114-c5.raw	94/10/28	94/12/26	18°23.22'S	28°10.02'W	17°50.46'S	29°17.76'W	3.87	3.98	791.	823.	34	60
m114-c6.raw	94/12/29	95/ 2/23	17°57.24'S	29°28.74'W	19°18.24'S	30°25.62'W	3.90	3.98	810.	824.	26	60
m114-c7.raw	95/ 3/ 1	95/ 4/29	19°22.74'S	30°33.18'W	18°56.22'S	29°19.92'W	3.86	4.09	808.	825.	59	60

Table 5 Summary of raw position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m114-c8.raw	95/ 5/ 2	95/ 6/30	18°59.58'S	29°31.14'W	18°43.92'S	30°34.98'W	3.86	4.00	807.	828.	58	60
m114-c9.raw	95/ 7/ 3	95/ 8/30	18°46.80'S	30°53.94'W	18° 0.12'S	31°35.40'W	4.00	4.17	786.	806.	59	60
m115-c1.raw	94/ 2/22	94/ 4/21	18°15.30'S	31°26.10'W	18°23.52'S	32°49.14'W	4.06	4.22	800.	813.	28	60
m115-c2.raw	94/ 4/27	94/ 6/23	18°26.04'S	33° 4.38'W	20° 4.56'S	31°31.50'W	4.16	4.41	779.	793.	29	60
m115-c3.raw	94/ 6/26	94/ 8/23	20°11.46'S	31°36.66'W	19°32.46'S	30°51.54'W	4.25	4.48	785.	790.	51	60
m115-c4.raw	94/ 8/28	94/10/24	19°45.00'S	30°56.40'W	19°38.94'S	30°25.32'W	4.27	4.34	791.	800.	43	60
m115-c5.raw	94/10/28	94/12/24	19°55.02'S	30°36.12'W	19°57.24'S	31°19.44'W	4.36	4.50	786.	795.	29	60
m115-c6.raw	94/12/30	95/ 2/25	20°13.14'S	31°10.20'W	19°18.60'S	31°12.78'W	4.24	4.38	798.	806.	42	60
m115-c7.raw	95/ 3/ 1	95/ 4/29	19° 9.18'S	31°33.84'W	19°32.40'S	31°28.50'W	3.85	4.17	793.	845.	43	60
m115-c8.raw	95/ 5/ 2	95/ 6/30	19°36.18'S	31°34.50'W	19°41.16'S	31°32.34'W	3.92	4.21	803.	842.	49	60
m115-c9.raw	95/ 7/ 3	95/ 8/31	19°41.46'S	31°41.76'W	21°57.96'S	31°57.12'W	4.15	4.51	782.	823.	56	60
m116-c1.raw	94/ 2/24	94/ 4/23	14°28.26'S	31° 1.50'W	14° 8.04'S	29° 8.22'W	4.10	4.20	800.	812.	28	60
m116-c2.raw	94/ 4/27	94/ 6/24	14° 7.62'S	29°24.42'W	14° 5.82'S	29°13.20'W	4.16	4.23	792.	805.	30	60
m116-c3.raw	94/ 6/28	94/ 8/25	14°13.32'S	29°25.20'W	13°45.06'S	29°41.76'W	4.17	4.24	792.	799.	26	60
m116-c4.raw	94/ 8/29	94/10/26	13°40.62'S	30° 2.10'W	13°37.08'S	30°23.40'W	4.12	4.18	798.	808.	28	60
m116-c5.raw	94/10/30	94/12/27	13°13.50'S	30°43.14'W	14°11.46'S	30°57.30'W	4.11	4.19	800.	822.	27	60
m116-c6.raw	94/12/31	95/ 2/27	14° 5.88'S	31°13.02'W	13°29.46'S	31°37.08'W	3.95	4.15	804.	839.	31	60
m116-c7.raw	95/ 3/ 2	95/ 4/30	13°38.52'S	31°46.68'W	14°43.86'S	32°25.92'W	4.02	4.12	796.	823.	60	60
m116-c8.raw	95/ 5/ 3	95/ 7/ 1	14°39.12'S	32°43.50'W	14°29.16'S	30° 4.56'W	3.95	4.15	805.	838.	57	60
m116-c9.raw	95/ 7/ 4	95/ 9/ 1	14°32.04'S	30°23.04'W	15° 0.24'S	28° 3.06'W	3.88	4.00	806.	853.	58	60
m117-c1.raw	94/ 2/24	94/ 4/23	14°15.66'S	30°45.42'W	13°53.94'S	31°38.04'W	4.31	4.40	794.	806.	30	60
m117-c2.raw	94/ 4/27	94/ 6/24	13°55.50'S	31°59.52'W	12°54.30'S	32°41.16'W	4.32	4.39	794.	803.	27	60
m117-c3.raw	94/ 6/28	94/ 8/25	12°46.62'S	33°18.54'W	12°43.38'S	32°42.12'W	4.16	4.61	792.	804.	30	60
m117-c4.raw	94/ 8/29	94/10/26	12°50.76'S	33° 0.00'W	12°35.52'S	33°38.16'W	4.43	4.59	797.	821.	27	60
m117-c5.raw	94/10/30	94/12/25	12°50.46'S	33°33.96'W	11° 0.90'S	32°51.18'W	4.37	4.69	796.	827.	19	60
m117-c6.raw	94/12/31	95/ 2/27	10°52.92'S	33° 0.30'W	13° 2.16'S	34°17.64'W	4.29	4.59	790.	823.	20	60
m117-c7.raw	95/ 3/ 2	95/ 4/30	13°12.00'S	34°35.40'W	12°30.84'S	34°53.40'W	3.95	4.17	779.	1041.	60	60
m117-c8.raw	95/ 5/ 3	95/ 7/ 1	12°39.90'S	35° 3.18'W	13° 1.02'S	34° 2.16'W	3.95	4.35	786.	1077.	60	60
m117-c9.raw	95/ 7/ 4	95/ 9/ 1	13° 2.88'S	34°16.26'W	9°48.84'S	33°34.38'W	4.19	4.59	790.	849.	59	60
m118-c1.raw	94/ 2/26	94/ 4/25	13° 2.88'S	38° 0.96'W	9°37.50'S	32°25.32'W	3.97	4.45	801.	823.	27	60

Table 5 Summary of raw position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m118-c2.raw	94/ 4/29	94/ 6/26	9°37.08'S	32°23.16'W	9°35.46'S	30°57.12'W	4.24	4.78	780.	790.	27	60
m118-c3.raw	94/ 6/30	94/ 8/25	9°13.74'S	30°51.66'W	8° 4.50'S	31°12.96'W	4.33	4.39	811.	817.	21	60
m118-c4.raw	94/ 8/31	94/10/26	7°57.36'S	31°49.86'W	8°15.48'S	32°54.60'W	4.46	4.65	791.	807.	26	60
m118-c5.raw	94/11/ 1	94/12/29	8° 5.04'S	33° 5.94'W	7°13.92'S	30°36.48'W	4.35	4.68	793.	819.	23	60
m118-c6.raw	95/ 1/ 2	95/ 3/ 2	7°25.38'S	30°48.66'W	6°45.66'S	31°17.16'W	4.18	4.60	803.	828.	28	60
m118-c7.raw	95/ 3/ 5	95/ 5/ 3	6°49.50'S	31°38.04'W	8°11.82'S	31°41.64'W	4.40	4.80	785.	793.	59	60
m118-c8.raw	95/ 5/ 6	95/ 7/ 4	8°25.20'S	31°57.72'W	9°24.12'S	31° 1.86'W	4.32	4.51	804.	876.	60	60
m118-c9.raw	95/ 7/ 7	95/ 9/ 4	9°31.08'S	31°17.58'W	9° 2.34'S	30°57.24'W	4.22	4.52	821.	851.	59	60
m119-c1.raw	94/ 2/26	94/ 4/23	14° 2.22'S	30°59.16'W	13°25.44'S	31°14.40'W	4.10	4.20	787.	799.	20	60
m119-c2.raw	94/ 5/ 1	94/ 6/24	13°31.38'S	31°40.74'W	13°15.90'S	30°12.00'W	4.16	4.20	791.	805.	21	60
m119-c3.raw	94/ 6/28	94/ 8/25	13°19.56'S	30°24.48'W	12°40.50'S	28°35.94'W	4.13	4.24	788.	797.	26	60
m119-c4.raw	94/ 8/29	94/10/24	12°38.40'S	28°42.78'W	12°34.92'S	29°35.34'W	4.17	4.21	793.	807.	15	60
m119-c5.raw	94/10/30	94/12/28	12°35.10'S	29°27.54'W	11°43.26'S	28°16.08'W	4.27	4.39	779.	790.	20	60
m119-c6.raw	94/12/31	95/ 2/28	11°48.18'S	28°28.80'W	12°30.96'S	28°47.52'W	4.28	4.37	781.	798.	25	60
m119-c7.raw	95/ 3/ 3	95/ 5/ 1	12°46.02'S	29° 2.28'W	11°22.26'S	27°22.38'W	4.18	4.28	798.	819.	60	60
m119-c8.raw	95/ 5/ 4	95/ 7/ 2	11°21.66'S	27°25.44'W	11°34.56'S	27°25.38'W	4.20	4.25	799.	830.	60	60
m119-c9.raw	95/ 7/ 5	95/ 9/ 2	11°49.02'S	27°39.36'W	11°26.76'S	28°35.04'W	4.26	4.37	787.	820.	58	60
m120-c1.raw	94/ 2/26	94/ 4/23	14°19.26'S	31°13.56'W	14°20.16'S	29°36.90'W	4.22	4.29	805.	818.	22	60
m120-c2.raw	94/ 4/27	94/ 6/24	14°25.62'S	29°49.56'W	14°17.34'S	28°49.14'W	4.28	4.37	787.	796.	27	60
m120-c3.raw	94/ 6/28	94/ 8/25	14°16.50'S	28°54.90'W	15° 2.94'S	29°28.86'W	4.25	4.31	800.	811.	28	60
m120-c4.raw	94/ 8/29	94/10/27	15° 8.04'S	29°49.44'W	15°14.10'S	28°58.26'W	4.26	4.34	783.	793.	20	60
m120-c5.raw	94/10/30	94/12/27	15°41.04'S	29° 9.06'W	15°40.26'S	28°36.90'W	4.15	4.21	805.	814.	29	60
m120-c6.raw	94/12/31	95/ 2/28	15°45.06'S	28°38.76'W	16° 6.42'S	28°51.54'W	4.13	4.21	798.	808.	19	60
m120-c7.raw	95/ 3/ 3	95/ 5/ 1	16°15.72'S	28°57.18'W	16°41.82'S	30°42.72'W	4.07	4.14	813.	824.	57	60
m120-c8.raw	95/ 5/ 4	95/ 7/ 2	16°36.18'S	30°51.72'W	16°21.60'S	32°16.02'W	4.00	4.08	809.	817.	57	60
m120-c9.raw	95/ 7/ 5	95/ 9/ 2	16°24.72'S	32°27.78'W	16°32.52'S	31°51.42'W	4.08	4.14	790.	803.	57	60
v19.raw	94/ 2/26	95/ 8/17	13°13.26'S	37°56.46'W	11° 7.38'S	31°54.54'W	3.66	4.00	875.	1006.	307	540

Smooth position estimation

Each of the final raw position files are first checked for outliers (which are removed) using plots of latitude and longitude time series, and plot of the float speed modulus, grossly estimated as a first difference between consecutive positions. Then, a Lanczos filtering (see Appendix C) with cut-off period of 3 days and half-width of 10 days, is done on the final raw data files. Missing positions in the original file are first linearly interpolated prior to Lanczos filtering, but only if 4 consecutive daily positions are missing, that is if there is at most a 5 day gap in the trajectory. Furthermore, only the filtered positions corresponding to an existing raw position are preserved after filtering, in order not to create data ! Finally cubic spline functions are fitted on the latitude and longitude time series respectively to interpolate positions when at most 4 consecutive daily positions are missing, and to estimate the east and north velocity components. Average pressures are also corrected of the pressure offsets at surface, measured before launch (the .raw files are not corrected). This point is discussed further in Section 4.7.

The resulting Lanczos filtered and splined data files named .fin are summarized in Table 6.

Note that file ml18-c3.fin has been obtained without Lanczos filtering, and the missing positions have been created through cubic spline fit.

Table 6 Summary of final position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m101-c1.fin	94/ 2/19	94/ 4/19	26°38.94'S	36°19.44'W	26° 0.84'S	38°44.04'W	4.75	5.11	803.	815.	60	60
m101-c2.fin	94/ 4/22	94/ 6/20	26° 6.00'S	38°51.54'W	26°13.08'S	41°21.78'W	5.00	5.28	785.	795.	60	60
m101-c3.fin	94/ 6/23	94/ 8/21	26°15.84'S	41°17.34'W	27°56.40'S	42° 3.96'W	4.83	5.09	793.	799.	60	60
m101-c4.fin	94/ 8/24	94/10/22	28° 4.14'S	41°52.44'W	26°47.70'S	44°17.94'W	4.87	5.44	821.	830.	60	60
m101-c5.fin	94/10/25	94/12/23	27° 4.92'S	44°32.82'W	25° 6.06'S	44° 9.36'W	4.73	5.73	796.	804.	60	60
m101-c6.fin	94/12/26	95/ 2/13	25°16.20'S	44°30.90'W	22°28.14'S	40° 7.50'W	3.32	5.27	799.	1565.	50	60
m101-c7.fin	95/ 2/26	95/ 4/26	22°26.22'S	39°26.16'W	23°28.68'S	40°46.50'W	4.51	5.24	810.	815.	60	60
m101-c8.fin	95/ 4/29	95/ 6/26	23°59.82'S	41°15.24'W	19° 9.18'S	37°52.32'W	4.09	5.45	728.	815.	44	60
m101-c9.fin	95/ 8/ 2	95/ 8/28	20° 1.68'S	38°25.26'W	19°34.62'S	37°38.16'W	4.19	5.36	750.	815.	27	60
m102-c1.fin	94/ 2/19	94/ 4/19	26°20.46'S	36°19.56'W	26°13.50'S	38°38.52'W	4.72	5.04	802.	816.	60	60
m102-c2.fin	94/ 4/22	94/ 6/20	26°14.28'S	39° 1.92'W	26° 7.08'S	41°43.02'W	4.83	5.11	795.	803.	60	60
m102-c3.fin	94/ 6/23	94/ 8/21	26° 8.46'S	41°48.60'W	26°51.90'S	43°13.68'W	4.89	5.26	803.	811.	60	60
m102-c4.fin	94/ 8/24	94/10/22	27°27.06'S	42°54.06'W	25°55.20'S	43°53.34'W	4.42	5.29	808.	902.	60	60
m102-c5.fin	94/10/25	94/12/23	26° 0.42'S	44°10.20'W	24°56.88'S	42°26.76'W	4.13	5.08	807.	858.	60	60
m102-c6.fin	94/12/26	95/ 2/23	24°35.88'S	43°17.58'W	25°12.18'S	44°25.62'W	4.13	5.40	781.	863.	60	60
m102-c7.fin	95/ 2/26	95/ 4/26	25°37.98'S	44°59.76'W	24°30.24'S	43°13.38'W	3.27	4.75	811.	1558.	36	60
m102-c8.fin	95/ 4/29	95/ 6/27	24°18.06'S	42°29.22'W	26°55.02'S	45°30.18'W	3.70	5.08	772.	1032.	60	60
m102-c9.fin	95/ 6/30	95/ 8/28	27° 0.36'S	45°38.94'W	24°14.16'S	43° 5.28'W	3.99	5.17	819.	868.	60	60
m103-c1.fin	94/ 2/19	94/ 4/19	26°30.06'S	36° 8.46'W	26° 4.08'S	38° 1.02'W	4.38	4.99	817.	844.	60	60
m103-c2.fin	94/ 4/22	94/ 6/17	26° 1.08'S	37°59.64'W	26°30.48'S	38°49.68'W	4.80	4.95	791.	799.	57	60
m103-c3.fin	94/ 6/23	94/ 8/21	26°48.18'S	39° 7.50'W	26°45.48'S	40°10.50'W	4.96	5.13	795.	799.	60	60
m103-c4.fin	94/ 8/24	94/10/22	26°44.40'S	40°14.04'W	28°34.14'S	41°59.82'W	5.01	5.51	801.	806.	60	60
m103-c5.fin	94/10/25	94/12/23	28°45.36'S	42°20.58'W	28°49.02'S	45°59.76'W	5.34	5.93	809.	823.	60	60
m103-c6.fin	94/12/26	95/ 2/23	28°47.82'S	46°17.04'W	32°31.50'S	49°46.20'W	5.11	5.95	798.	816.	60	60
m104-c1.fin	94/ 2/19	94/ 4/19	26°37.80'S	35°57.90'W	26°10.50'S	36°59.22'W	4.41	4.98	809.	821.	60	60
m104-c2.fin	94/ 4/22	94/ 6/20	26°20.82'S	37° 8.28'W	26°58.68'S	37°52.68'W	4.59	4.90	808.	814.	60	60
m104-c3.fin	94/ 6/23	94/ 8/21	27° 5.52'S	37°54.36'W	26°49.56'S	38°29.34'W	4.50	4.75	829.	833.	60	60
m104-c4.fin	94/ 8/24	94/10/22	27° 0.42'S	38°30.12'W	26°39.54'S	38°29.58'W	4.71	4.92	791.	797.	60	60
m104-c5.fin	94/10/25	94/12/23	26°48.18'S	38° 7.92'W	28°10.50'S	39°13.74'W	4.49	5.03	809.	820.	60	60
m104-c6.fin	94/12/26	95/ 2/23	28°19.98'S	39°41.16'W	29°13.08'S	43°14.46'W	5.04	5.26	800.	804.	60	60

Table 6 Summary of final position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m104-c7.fin	95/ 2/26	95/ 4/26	29°30.24'S	43°14.52'W	31° 5.46'S	45°30.66'W	4.89	5.40	824.	828.	60	60
m104-c8.fin	95/ 4/29	95/ 6/27	31°13.08'S	45°20.82'W	30°50.22'S	46°32.46'W	4.98	5.60	807.	821.	60	60
m104-c9.fin	95/ 6/30	95/ 8/28	30°53.16'S	46°54.12'W	31°35.04'S	48°26.16'W	4.83	5.73	811.	829.	60	60
m105-c1.fin	94/ 2/19	94/ 4/19	26°19.20'S	35°56.64'W	25°59.88'S	36°40.50'W	4.49	5.11	800.	834.	60	60
m105-c2.fin	94/ 4/22	94/ 6/20	26° 6.18'S	36°53.94'W	26°43.92'S	37°49.98'W	4.87	5.09	793.	807.	60	60
m105-c3.fin	94/ 6/23	94/ 8/18	26°55.38'S	37°55.08'W	26°42.54'S	38°53.34'W	4.99	5.20	796.	812.	57	60
m105-c4.fin	94/ 8/24	94/10/22	26°43.08'S	38°50.34'W	26° 9.24'S	38°58.50'W	4.84	5.19	793.	818.	60	60
m105-c5.fin	94/10/25	94/12/21	26°12.48'S	38°42.66'W	25°27.66'S	38°24.24'W	4.67	5.26	785.	818.	58	60
m105-c6.fin	94/12/26	95/ 2/23	25°26.88'S	38°12.78'W	25°17.70'S	38°47.04'W	4.38	4.89	787.	834.	60	60
m105-c7.fin	95/ 2/26	95/ 4/26	25°24.48'S	38°39.60'W	25°57.06'S	38°54.48'W	4.51	4.96	789.	817.	60	60
m105-c8.fin	95/ 4/29	95/ 6/27	25°39.06'S	38°50.04'W	25°50.70'S	41° 9.66'W	4.61	4.84	788.	836.	60	60
m105-c9.fin	95/ 6/30	95/ 8/28	25°58.56'S	41°24.30'W	25°51.24'S	41° 2.40'W	4.71	5.23	787.	839.	60	60
m106-c1.fin	94/ 2/20	94/ 4/20	22°40.50'S	32°59.52'W	23°34.98'S	34°28.86'W	4.47	4.68	803.	826.	60	60
m106-c2.fin	94/ 4/23	94/ 6/21	23°48.30'S	34°37.14'W	23°36.96'S	34°28.80'W	4.49	4.97	798.	809.	60	60
m106-c3.fin	94/ 6/24	94/ 8/22	23°46.02'S	34°32.64'W	25°11.16'S	35°30.42'W	4.62	5.12	800.	808.	60	60
m106-c4.fin	94/ 8/25	94/10/23	25°16.02'S	35°13.32'W	24° 4.80'S	36° 0.48'W	4.67	5.23	787.	812.	60	60
m106-c5.fin	94/10/26	94/12/24	24°12.42'S	35°42.84'W	24°52.86'S	35° 8.76'W	4.57	4.83	795.	814.	60	60
m106-c6.fin	94/12/27	95/ 2/24	25° 4.44'S	34°34.38'W	25°11.88'S	35°31.02'W	4.59	4.90	785.	814.	60	60
m106-c7.fin	95/ 2/27	95/ 4/27	25°19.50'S	35°19.14'W	24°30.42'S	36°12.00'W	4.15	4.71	802.	861.	60	60
m106-c8.fin	95/ 4/30	95/ 6/28	24°18.36'S	36°25.50'W	22°45.84'S	36° 9.30'W	4.44	4.86	790.	823.	60	60
m106-c9.fin	95/ 7/ 1	95/ 8/29	23° 1.26'S	36°49.74'W	23°22.74'S	38°31.14'W	4.30	5.29	796.	886.	60	60
m107-c1.fin	94/ 2/22	94/ 4/21	22°21.84'S	33° 7.50'W	21°47.64'S	34°26.58'W	4.41	4.60	791.	802.	59	60
m107-c2.fin	94/ 4/24	94/ 6/22	21°55.92'S	34°35.58'W	22°51.42'S	37°42.60'W	4.50	4.74	796.	805.	60	60
m107-c3.fin	94/ 6/25	94/ 8/23	22°52.98'S	37°40.38'W	23°22.20'S	38° 8.52'W	4.87	5.03	789.	802.	60	60
m107-c4.fin	94/ 8/26	94/10/24	23°21.18'S	38° 0.96'W	23° 5.94'S	37°41.76'W	4.42	5.01	801.	816.	60	60
m107-c5.fin	94/10/27	94/12/25	23°16.74'S	37°37.56'W	23°26.76'S	39°30.60'W	4.58	4.85	794.	806.	60	60
m107-c6.fin	94/12/28	95/ 2/25	23°39.66'S	39°43.20'W	24° 9.00'S	39°25.20'W	4.86	5.35	794.	806.	60	60
m107-c7.fin	95/ 2/28	95/ 4/28	24°24.36'S	39° 3.00'W	25°46.14'S	39° 9.78'W	4.61	4.81	805.	813.	60	60
m107-c8.fin	95/ 5/ 1	95/ 6/29	25°58.86'S	39° 5.88'W	26° 7.44'S	39°16.14'W	4.57	4.85	797.	811.	60	60
m107-c9.fin	95/ 7/ 2	95/ 8/30	26° 9.42'S	39°16.32'W	27° 3.18'S	39°14.94'W	4.74	4.91	809.	820.	60	60

Table 6 Summary of final position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m108-c1.fin	94/ 2/22	94/ 4/21	22°30.18'S	32°55.50'W	21°43.92'S	34°15.12'W	4.28	4.46	813.	824.	59	60
m108-c2.fin	94/ 4/24	94/ 6/22	21°51.24'S	34°28.92'W	22°39.12'S	37°42.42'W	4.43	4.67	802.	812.	60	60
m108-c3.fin	94/ 6/25	94/ 8/23	22°40.20'S	37°43.92'W	23° 5.46'S	38°28.08'W	4.66	4.81	804.	812.	60	60
m108-c4.fin	94/ 8/26	94/10/24	23° 2.52'S	38°25.62'W	23° 7.86'S	39°29.46'W	4.61	5.09	795.	832.	60	60
m108-c5.fin	94/10/27	94/12/25	23°23.46'S	39°37.68'W	22°15.90'S	39°43.02'W	4.47	5.07	789.	804.	60	60
m108-c6.fin	94/12/28	95/ 2/25	23°15.18'S	39°42.72'W	19°53.10'S	37°30.84'W	3.91	5.47	784.	823.	52	60
m108-c7.fin	95/ 2/28	95/ 4/28	20° 6.42'S	37°25.86'W	16° 6.90'S	36°18.30'W	3.90	5.37	776.	828.	43	60
m108-c8.fin	95/ 5/ 1	95/ 6/27	15°51.78'S	36°34.20'W	13°11.94'S	38°22.26'W	3.93	5.40	793.	896.	22	60
m109-c1.fin	94/ 2/21	94/ 4/21	22°38.58'S	32°40.20'W	21°34.08'S	34°24.54'W	4.22	4.29	814.	825.	60	60
m109-c2.fin	94/ 4/24	94/ 6/22	21°42.60'S	34°41.52'W	22°54.72'S	37°30.12'W	4.33	4.55	796.	810.	60	60
m109-c3.fin	94/ 6/25	94/ 8/23	22°54.96'S	37°33.60'W	23°18.12'S	38° 6.78'W	4.58	4.74	811.	821.	60	60
m109-c4.fin	94/ 8/26	94/10/24	23°15.90'S	38° 3.84'W	23°15.84'S	37°55.86'W	4.60	4.89	795.	804.	60	60
m109-c5.fin	94/10/27	94/12/25	23°30.18'S	37°51.24'W	23°45.36'S	37°50.76'W	4.89	5.15	784.	796.	60	60
m109-c6.fin	94/12/28	95/ 2/25	23°54.18'S	37°26.64'W	23°47.16'S	38°12.42'W	4.69	4.99	800.	812.	60	60
m109-c7.fin	95/ 2/28	95/ 4/28	24° 5.64'S	37°54.78'W	23°22.26'S	38°50.34'W	4.64	5.06	805.	815.	60	60
m109-c8.fin	95/ 5/ 1	95/ 6/29	23°26.16'S	39° 2.64'W	24°39.12'S	39°23.52'W	4.57	4.97	802.	813.	60	60
m109-c9.fin	95/ 7/ 2	95/ 8/30	24°33.72'S	39°19.56'W	24°22.86'S	40°36.30'W	4.45	4.84	798.	815.	60	60
m110-c1.fin	94/ 2/21	94/ 4/21	22°19.14'S	32°43.14'W	21°42.36'S	34°45.36'W	4.39	4.60	801.	815.	60	60
m110-c2.fin	94/ 4/24	94/ 6/22	21°56.70'S	34°58.50'W	22°46.92'S	36°42.30'W	4.62	4.75	784.	797.	60	60
m110-c3.fin	94/ 6/25	94/ 8/23	22°55.86'S	36°37.86'W	22°28.56'S	36°57.66'W	4.64	4.98	791.	802.	60	60
m110-c4.fin	94/ 8/26	94/10/24	22°46.50'S	36°51.36'W	24°21.06'S	38°40.62'W	4.36	4.97	790.	842.	60	60
m110-c5.fin	94/10/27	94/12/25	24°52.14'S	38°48.12'W	25°26.34'S	41°22.74'W	4.72	5.01	803.	836.	60	60
m110-c6.fin	94/12/28	95/ 2/25	25°43.14'S	41°19.56'W	26° 6.24'S	42° 3.96'W	5.01	5.30	793.	807.	60	60
m110-c7.fin	95/ 2/28	95/ 4/28	25°47.16'S	41°30.00'W	25°18.48'S	41°16.50'W	2.99	5.24	819.	2632.	60	60
m110-c8.fin	95/ 5/ 1	95/ 6/29	25°15.54'S	41°12.42'W	25°24.18'S	43° 2.76'W	3.31	5.03	816.	1389.	60	60
m110-c9.fin	95/ 7/ 2	95/ 8/ 3	25°29.58'S	43°22.44'W	25° 0.42'S	43°51.66'W	3.36	5.21	805.	1930.	27	60
m111-c1.fin	94/ 2/22	94/ 4/21	18°41.40'S	31°23.52'W	19°29.22'S	29°23.22'W	3.92	4.15	815.	833.	54	60
m111-c2.fin	94/ 4/25	94/ 6/22	19°29.76'S	29°16.56'W	18°17.16'S	27°35.94'W	3.96	4.07	816.	827.	59	60
m111-c3.fin	94/ 6/28	94/ 8/24	18°20.58'S	27°35.28'W	19°37.14'S	25°52.50'W	4.02	4.16	801.	811.	58	60
m111-c4.fin	94/ 8/27	94/10/25	19°45.42'S	26° 0.66'W	19°52.62'S	24° 0.66'W	4.09	4.23	807.	818.	60	60

Table 6 Summary of final position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m111-c5.fin	94/10/28	94/12/26	19°58.56'S	24°13.02'W	20°34.26'S	24°38.40'W	4.07	4.18	812.	824.	60	60
m111-c6.fin	94/12/30	95/ 2/26	20°52.80'S	24°50.40'W	20°43.68'S	24°10.98'W	3.93	4.41	796.	893.	59	60
m111-c7.fin	95/ 3/ 1	95/ 4/29	20°41.34'S	24°10.62'W	19°34.68'S	23° 8.52'W	3.86	4.39	805.	905.	60	60
m111-c8.fin	95/ 5/ 2	95/ 6/30	19°33.42'S	23°11.58'W	19°43.98'S	20° 4.80'W	3.76	4.38	802.	887.	60	60
m111-c9.fin	95/ 7/ 3	95/ 8/31	19°44.16'S	20°10.26'W	19°41.28'S	18°42.12'W	3.79	4.14	802.	879.	60	60
m112-c1.fin	94/ 2/22	94/ 4/19	18°29.88'S	31°40.02'W	18°34.44'S	33°43.20'W	4.26	4.34	777.	788.	52	60
m112-c2.fin	94/ 4/25	94/ 6/22	18°24.18'S	34° 5.82'W	17°59.88'S	33°45.18'W	4.23	4.39	770.	775.	44	60
m112-c3.fin	94/ 6/28	94/ 8/24	18°17.34'S	33°36.54'W	17°46.56'S	34° 7.32'W	4.12	4.27	767.	774.	53	60
m112-c4.fin	94/ 8/27	94/10/24	17°37.68'S	34°16.86'W	19°16.62'S	35°59.22'W	4.03	4.21	778.	788.	35	60
m112-c5.fin	94/10/30	94/12/26	19°31.14'S	35°48.54'W	17°28.26'S	36°46.08'W	4.09	4.51	777.	784.	28	60
m112-c6.fin	94/12/29	95/ 2/26	17°24.66'S	37° 2.64'W	13° 9.54'S	38° 4.56'W	3.83	4.84	784.	802.	10	60
m112-c7.fin	95/ 3/ 4	95/ 4/29	12°50.58'S	37°40.50'W	4°41.40'S	34°56.70'W	4.17	4.90	772.	828.	57	60
m112-c8.fin	95/ 5/ 2	95/ 6/30	4° 2.76'S	36°27.12'W	2°29.82'S	38°48.90'W	4.12	4.78	756.	768.	52	60
m112-c9.fin	95/ 7/ 3	95/ 8/30	1°40.32'S	41°36.36'W	1°48.36'S	42°49.14'W	4.44	5.19	767.	801.	36	60
m113-c1.fin	94/ 2/22	94/ 4/21	18°26.16'S	31°26.16'W	18°31.26'S	31°25.80'W	4.00	4.19	801.	821.	59	60
m113-c2.fin	94/ 4/25	94/ 6/22	18°43.98'S	31°25.80'W	18°59.70'S	28°50.46'W	4.01	4.14	809.	819.	54	60
m113-c3.fin	94/ 6/26	94/ 8/23	19°14.04'S	28°52.92'W	19°48.06'S	27°29.94'W	4.08	4.13	806.	832.	59	60
m113-c4.fin	94/ 8/27	94/10/25	19°55.56'S	27°28.68'W	20°24.36'S	27° 4.20'W	3.77	4.24	809.	912.	60	60
m113-c5.fin	94/10/28	94/12/26	20°35.46'S	27°13.56'W	21° 8.70'S	26°10.68'W	4.35	4.42	792.	800.	60	60
m113-c6.fin	94/12/29	95/ 2/26	21°14.16'S	26°26.52'W	21°44.40'S	25°52.02'W	3.68	4.34	825.	969.	60	60
m113-c7.fin	95/ 3/ 1	95/ 4/29	21°35.46'S	26° 5.40'W	22° 2.22'S	25°39.78'W	4.37	4.64	790.	803.	60	60
m113-c8.fin	95/ 5/ 2	95/ 6/30	22°11.76'S	25°31.68'W	22°20.58'S	24°53.82'W	4.42	4.54	800.	809.	60	60
m113-c9.fin	95/ 7/ 3	95/ 8/31	22° 8.34'S	25°13.38'W	22°28.56'S	27°46.20'W	4.32	4.58	807.	816.	60	60
m114-c1.fin	94/ 2/22	94/ 4/21	18°27.00'S	31° 9.66'W	19°22.98'S	29°32.82'W	3.92	4.01	803.	817.	59	60
m114-c2.fin	94/ 4/25	94/ 6/22	19°27.72'S	29°31.14'W	18°18.96'S	27°38.10'W	3.97	4.15	786.	795.	59	60
m114-c3.fin	94/ 6/26	94/ 8/24	18°24.18'S	27°45.54'W	18°37.20'S	26°17.94'W	3.96	4.06	795.	801.	60	60
m114-c4.fin	94/ 8/27	94/10/24	18°39.84'S	26°28.32'W	18°14.70'S	28° 2.58'W	4.01	4.08	788.	795.	59	60
m114-c5.fin	94/10/28	94/12/26	18°23.22'S	28°10.02'W	17°50.46'S	29°17.76'W	3.87	3.98	795.	827.	60	60
m114-c6.fin	94/12/29	95/ 2/23	17°57.24'S	29°28.74'W	19°18.24'S	30°25.62'W	3.90	3.98	814.	828.	57	60
m114-c7.fin	95/ 3/ 1	95/ 4/29	19°22.74'S	30°33.18'W	18°56.22'S	29°19.92'W	3.86	4.09	812.	829.	60	60

Table 6 Summary of final position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m114-c8.fin	95/ 5/ 2	95/ 6/30	18°59.58'S	29°31.14'W	18°43.92'S	30°34.98'W	3.86	4.00	811.	832.	60	60
m114-c9.fin	95/ 7/ 3	95/ 8/30	18°46.80'S	30°53.94'W	18° 0.12'S	31°35.40'W	4.00	4.17	790.	810.	59	60
m115-c1.fin	94/ 2/22	94/ 4/21	18°15.30'S	31°26.10'W	18°23.52'S	32°49.14'W	4.06	4.22	800.	813.	59	60
m115-c2.fin	94/ 4/27	94/ 6/23	18°26.04'S	33° 4.38'W	20° 4.56'S	31°31.50'W	4.16	4.41	779.	793.	58	60
m115-c3.fin	94/ 6/26	94/ 8/23	20°11.46'S	31°36.66'W	19°32.46'S	30°51.54'W	4.25	4.48	785.	790.	59	60
m115-c4.fin	94/ 8/28	94/10/24	19°45.00'S	30°56.40'W	19°38.94'S	30°25.32'W	4.27	4.34	791.	800.	58	60
m115-c5.fin	94/10/28	94/12/24	19°55.02'S	30°36.12'W	19°57.24'S	31°19.44'W	4.36	4.50	786.	795.	53	60
m115-c6.fin	94/12/30	95/ 2/25	20°13.14'S	31°10.20'W	19°18.60'S	31°12.78'W	4.24	4.38	798.	806.	58	60
m115-c7.fin	95/ 3/ 1	95/ 4/29	19° 9.18'S	31°33.84'W	19°32.40'S	31°28.50'W	3.85	4.17	793.	845.	60	60
m115-c8.fin	95/ 5/ 2	95/ 6/30	19°36.18'S	31°34.50'W	19°41.16'S	31°32.34'W	3.92	4.21	803.	842.	60	60
m115-c9.fin	95/ 7/ 3	95/ 8/31	19°41.46'S	31°41.76'W	21°57.96'S	31°57.12'W	4.15	4.51	782.	823.	60	60
m116-c1.fin	94/ 2/24	94/ 4/23	14°28.26'S	31° 1.50'W	14° 8.04'S	29° 8.22'W	4.10	4.20	801.	813.	54	60
m116-c2.fin	94/ 4/27	94/ 6/24	14° 7.62'S	29°24.42'W	14° 5.82'S	29°13.20'W	4.16	4.23	793.	806.	59	60
m116-c3.fin	94/ 6/28	94/ 8/25	14°13.32'S	29°25.20'W	13°45.06'S	29°41.76'W	4.17	4.24	793.	800.	59	60
m116-c4.fin	94/ 8/29	94/10/26	13°40.62'S	30° 2.10'W	13°37.08'S	30°23.40'W	4.12	4.18	799.	809.	59	60
m116-c5.fin	94/10/30	94/12/27	13°13.50'S	30°43.14'W	14°11.46'S	30°57.30'W	4.11	4.19	801.	823.	59	60
m116-c6.fin	94/12/31	95/ 2/27	14° 5.88'S	31°13.02'W	13°29.46'S	31°37.08'W	3.95	4.15	805.	840.	59	60
m116-c7.fin	95/ 3/ 2	95/ 4/30	13°38.52'S	31°46.68'W	14°43.86'S	32°25.92'W	4.02	4.12	797.	824.	60	60
m116-c8.fin	95/ 5/ 3	95/ 7/ 1	14°39.12'S	32°43.50'W	14°29.16'S	30° 4.56'W	3.95	4.15	806.	839.	60	60
m116-c9.fin	95/ 7/ 4	95/ 9/ 1	14°32.04'S	30°23.04'W	15° 0.24'S	28° 3.06'W	3.88	4.00	807.	854.	60	60
m117-c1.fin	94/ 2/24	94/ 4/23	14°15.66'S	30°45.42'W	13°53.94'S	31°38.04'W	4.31	4.40	796.	808.	59	60
m117-c2.fin	94/ 4/27	94/ 6/24	13°55.50'S	31°59.52'W	12°54.30'S	32°41.16'W	4.32	4.39	796.	805.	59	60
m117-c3.fin	94/ 6/28	94/ 8/25	12°46.62'S	33°18.54'W	12°43.38'S	32°42.12'W	4.16	4.61	794.	806.	59	60
m117-c4.fin	94/ 8/29	94/10/26	12°50.76'S	33° 0.00'W	12°35.52'S	33°38.16'W	4.43	4.59	799.	823.	59	60
m117-c5.fin	94/10/30	94/12/25	12°50.46'S	33°33.96'W	11° 0.90'S	32°51.18'W	4.37	4.69	798.	829.	43	60
m117-c6.fin	94/12/31	95/ 2/27	10°52.92'S	33° 0.30'W	13° 2.16'S	34°17.64'W	4.29	4.59	792.	825.	47	60
m117-c7.fin	95/ 3/ 2	95/ 4/30	13°12.00'S	34°35.40'W	12°30.84'S	34°53.40'W	3.95	4.17	781.	1043.	60	60
m117-c8.fin	95/ 5/ 3	95/ 7/ 1	12°39.90'S	35° 3.18'W	13° 1.02'S	34° 2.16'W	3.95	4.35	788.	1079.	60	60
m117-c9.fin	95/ 7/ 4	95/ 9/ 1	13° 2.88'S	34°16.26'W	9°48.84'S	33°34.38'W	4.19	4.59	792.	851.	60	60
m118-c1.fin	94/ 2/26	94/ 4/25	13° 2.88'S	38° 0.96'W	9°37.50'S	32°25.32'W	3.97	4.45	804.	826.	59	60

Table 6 Summary of final position files for the 20 SAMBA1 MARVORs

File	first date	last date	first latitude	first longitude	last latitude	last longitude	minimal temperature (°C)	maximal temperature (°C)	minimal pressure (dbar)	maximal pressure (dbar)	number of estimated positions	number of records
m118-c2.fin	94/ 4/29	94/ 6/26	9°37.08'S	32°23.16'W	9°35.46'S	30°57.12'W	4.24	4.78	783.	793.	59	60
m118-c3.fin	94/ 6/30	94/ 8/25	9°13.74'S	30°51.66'W	8° 4.50'S	31°12.96'W	4.33	4.39	814.	820.	57	60
m118-c4.fin	94/ 8/31	94/10/26	7°57.36'S	31°49.86'W	8°15.48'S	32°54.60'W	4.46	4.65	794.	810.	57	60
m118-c5.fin	94/11/ 1	94/12/29	8° 5.04'S	33° 5.94'W	7°13.92'S	30°36.48'W	4.35	4.68	796.	822.	59	60
m118-c6.fin	95/ 1/ 2	95/ 3/ 2	7°25.38'S	30°48.66'W	6°45.66'S	31°17.16'W	4.18	4.60	806.	831.	55	60
m118-c7.fin	95/ 3/ 5	95/ 5/ 3	6°49.50'S	31°38.04'W	8°11.82'S	31°41.64'W	4.40	4.80	788.	796.	60	60
m118-c8.fin	95/ 5/ 6	95/ 7/ 4	8°25.20'S	31°57.72'W	9°24.12'S	31° 1.86'W	4.32	4.51	807.	879.	60	60
m118-c9.fin	95/ 7/ 7	95/ 9/ 4	9°31.08'S	31°17.58'W	9° 2.34'S	30°57.24'W	4.22	4.52	824.	854.	60	60
m119-c1.fin	94/ 2/26	94/ 4/23	14° 2.22'S	30°59.16'W	13°25.44'S	31°14.40'W	4.10	4.20	809.	821.	47	60
m119-c2.fin	94/ 5/ 1	94/ 6/24	13°31.38'S	31°40.74'W	13°15.90'S	30°12.00'W	4.16	4.20	813.	827.	50	60
m119-c3.fin	94/ 6/28	94/ 8/25	13°19.56'S	30°24.48'W	12°40.50'S	28°35.94'W	4.13	4.24	810.	819.	59	60
m119-c4.fin	94/ 8/29	94/10/24	12°38.40'S	28°42.78'W	12°34.92'S	29°35.34'W	4.17	4.21	815.	829.	35	60
m119-c5.fin	94/10/30	94/12/28	12°35.10'S	29°27.54'W	11°43.26'S	28°16.08'W	4.27	4.39	801.	812.	50	60
m119-c6.fin	94/12/31	95/ 2/28	11°48.18'S	28°28.80'W	12°30.96'S	28°47.52'W	4.28	4.37	803.	820.	45	60
m119-c7.fin	95/ 3/ 3	95/ 5/ 1	12°46.02'S	29° 2.28'W	11°22.26'S	27°22.38'W	4.18	4.28	820.	841.	60	60
m119-c8.fin	95/ 5/ 4	95/ 7/ 2	11°21.66'S	27°25.44'W	11°34.56'S	27°25.38'W	4.20	4.25	821.	852.	60	60
m119-c9.fin	95/ 7/ 5	95/ 9/ 2	11°49.02'S	27°39.36'W	11°26.76'S	28°35.04'W	4.26	4.37	809.	842.	60	60
m120-c1.fin	94/ 2/26	94/ 4/23	14°19.26'S	31°13.56'W	14°20.16'S	29°36.90'W	4.22	4.29	810.	823.	52	60
m120-c2.fin	94/ 4/27	94/ 6/24	14°25.62'S	29°49.56'W	14°17.34'S	28°49.14'W	4.28	4.37	792.	801.	59	60
m120-c3.fin	94/ 6/28	94/ 8/25	14°16.50'S	28°54.90'W	15° 2.94'S	29°28.86'W	4.25	4.31	805.	816.	59	60
m120-c4.fin	94/ 8/29	94/10/27	15° 8.04'S	29°49.44'W	15°14.10'S	28°58.26'W	4.26	4.34	788.	798.	55	60
m120-c5.fin	94/10/30	94/12/27	15°41.04'S	29° 9.06'W	15°40.26'S	28°36.90'W	4.15	4.21	810.	819.	59	60
m120-c6.fin	94/12/31	95/ 2/28	15°45.06'S	28°38.76'W	16° 6.42'S	28°51.54'W	4.13	4.21	803.	813.	43	60
m120-c7.fin	95/ 3/ 3	95/ 5/ 1	16°15.72'S	28°57.18'W	16°41.82'S	30°42.72'W	4.07	4.14	818.	829.	60	60
m120-c8.fin	95/ 5/ 4	95/ 7/ 2	16°36.18'S	30°51.72'W	16°21.60'S	32°16.02'W	4.00	4.08	814.	822.	60	60
m120-c9.fin	95/ 7/ 5	95/ 9/ 2	16°24.72'S	32°27.78'W	16°32.52'S	31°51.42'W	4.08	4.14	795.	808.	60	60
v19.fin	94/ 2/26	95/ 8/17	13°13.26'S	37°56.46'W	11° 7.38'S	31°54.54'W	3.66	4.00	875.	1006.	474	540

4.6 Lagrangian float data

Tables 5 and 6 in the preceding Section give summaries of the position files (.raw and .fin respectively). Figures 10 and 11 are plots of float displacements and "acoustic" trajectories from the SAMBA1 deployments, showing results through August 1995 (i.e. over one year and a half).

Figure 10 shows for the 20 MARVORs (and the ALFOS) deployed the submerged displacements over the 60 days from the submergence point to the next surfacing position (tip of arrowhead). The gaps between arrows represent the on-surface drifts tracked from ARGOS fixes over the 2-day on-surface period. MARVOR floats are near 800 dbar at the core of Antarctic Intermediate Water (AAIW) and generally maintained their depth within ±50 dbar[1], owing to their active depth control. The ALFOS was ballasted at atmospheric pressure for about 800 m but drifted rather near 1000 m depth and maintained its depth with ±100 m variations during the first 6 cycles (not so well during cycles 7, 8 and 9, however). The VCM was also ballasted at atmospheric pressure and for 800 m. It equilibrated near 900 m but gradually sank to 1000 m over its 1.5 year life.

Figure 11 shows the MARVOR trajectories (.fin files with one daily estimated position) obtained from acoustical tracking, over their first 9 cycles (18 months). The VCM trajectory over the same time period is also given. Accuracy of submerged position is typically ±5 km.

A bar graph, page 81, gives the times over which the floats were tracked at depth.

Individual float results are presented on pages 83 to 415.

For each of the floats one finds a presentation sheet, the T and P time series over the float lifetime, and the corresponding trajectory (for the ALFOS, only the 60-day displacements).

For each of the 20 MARVORs, and for every 6-month period, one finds then:

• A statistical log which comprises

- Sample mean velocity components $\bar{u}$ and $\bar{v}$ and the 95 % confidence interval for $\langle u \rangle$ and $\langle v \rangle$ centered on $\bar{u}$ and $\bar{v}$, estimated with Student's law.

- Sample variances and covariance of velocity components $\overline{u'u'}$, $\overline{v'v'}$ and $\overline{u'v'}$, together with the 95 % confidence interval for $\langle u'u'(0) \rangle$, $\langle v'v'(0) \rangle$ and $\langle u'v'(0) \rangle$.

- Eddy Kinetic Energy (EKE) in cm^2s^{-2} and its 95 % confidence inerval.

Statistics are given only for the trajectories or parts of trajectories corresponding to the 800±100 dbar interval. 95 % confidence intervals are estimated by assuming a 5-day integral time scale and a gaussian distribution of daily velocity components. Sample mean and variance of temperature, as well as covariances between temperature and velocity components are also given.

• Raw trajectories (one dot per position estimate). Squares give the float launch position, crosses the first estimated positions. Bathymetric lines from the General Bathymetric Chart of the Oceans (GEBCO, 5th ed.) are drawn at 200, 500, 1000, 2000 and 3000 m depth. The corresponding .raw data files are listed in Table 5. ARGOS surface positions are given by triangles.

• Temperature and pressure time series. Two successive values are joined by solid line only if 24 h apart. Recall that MARVOR temperature and pressure values are averages over the preceding 24 hourly instant measurements. Pressures are corrected by their surface offset at launch.

1.Notable exceptions concern MARVOR #101 (cycle 6), #102 (cycles 7 and 8), #110 (cycles 7, 8 and 9) and #117 (cycles 7 and 8). They suddenly sank to greater depth in the order of 10 days (to 1565, 1556, 1030, 2487, 1389, 1928, 1041 and 1077 dbar respectively) (see also Section 4.7).

• Velocity stick plot. North is up and the stick is pointing in the direction where the current is going (contrary to the Meteorological convention). There is one daily velocity vector, resulting from the cubic spline fit. The vertical lines separating the different cycles are plotted at 0 h UT on the day of the float plunging at the beginning of the next cycle.

• Lanczos filtered and splined, trajectories. Two successive positions are joined by solid line only if 24 h apart (that is the nominal sampling interval). There is one arrow every 30 days, time being reckoned from the launching day or the plunging day (for example, with a launch date on 1950JD nº12239, the first arrow will have its tip on the position available after 0 h UT during 1950JD nº12269). The corresponding .fin data files are listed in Table 6. They are also referred to in the statistical log.

For the VCM, one finds instead, and before the statistical log for its 1.5 year lifetime, the 1/2 turn and pressure time series, the vertical displacement and vertical velocity time series consequently estimated (assumptions being that one turn corresponds to a flow of 1 m of water past the float, and 1 dbar = 1 m).

For the ALFOS, no statistics are given since we do not have its trajectory, nor its measured temperature.

To be complete, here is how statistics are estimated.

N being the number of data values and $\Delta = 24$ h the sampling interval, N is also the number of days of float data. The 95 % confidence interval for $\langle u \rangle$, centered on $\bar{u}$ is estimated, owing to the gaussian assumption, as $\pm q_{0.975} \cdot \frac{s}{\sqrt{N_{df}}}$ where $q_{0.975}$ is the .975th quantile of the Student's t distribution with $N_{df} - 1$ degrees of freedom and s^2 is given by the sample variance $\overline{u'u'} = \frac{1}{N} \sum_{i=1}^{N} \left(u_i - \bar{u}\right)^2$. Note that $\overline{u'u'}$ is only an approximation for s^2 which should be defined as $\frac{1}{N_{df} - 1} \sum_{i=1}^{N_{df}} u_i'^2$, the u_i' being N_{df} independent observations. N_{df} the number of degrees of freedom is estimated as $\frac{N}{2 \cdot 5}$ because we assume a 5-day integral time scale. This integral time scale T_{uu} is defined as $T_{uu} = \frac{1}{\langle u'u'(0) \rangle} \int_0^{\infty} \langle u'u'(\tau) \rangle d\tau$ and it can be shown that $\operatorname{var}(\bar{u}) \approx \frac{2 \langle u'u'(0) \rangle \cdot T_{uu}}{N \cdot \Delta}$. In fact, as soon as N_{df} is greater than 30, one could use $\pm 2 \cdot \frac{s}{\sqrt{N_{df}}}$ since the Student distribution converges towards normal (exact gaussian 95 % confidence interval is $\pm 1.96 \cdot \frac{\sigma}{\sqrt{N_{df}}}$). For $N_{df} > 30$, relative error is 2 %, since $q_{0.975} = 2.042$ for 30 degrees of freedom (cf. Mood, Graybill and Boes, 1974, for example). The 95 % confidence interval for $\langle v \rangle$, centered on $\bar{v}$ is estimated along the same lines as that for the east velocity component. The 95 % confidence interval for $\langle u'u'(0) \rangle$ is estimated, owing to the gaussian assumption, as $\left[\frac{\left(\tilde{N}_{df} - 1\right) \cdot \overline{u'u'}}{q_{0.975}}, \frac{\left(\tilde{N}_{df} - 1\right) \cdot \overline{u'u'}}{q_{0.025}}\right]$ where $q_{0.025}$ and $q_{0.975}$ are the 0.025th and 0.975th quantiles of the chi square distribution with $\tilde{N}_{df} - 1$ degrees of freedom.

$\tilde{N}_{df}$ the number of degrees of freedom should be defined as $\frac{N \cdot \Delta}{2\tilde{T}_{uu}}$ where $\tilde{T}_{uu}$ is the integral time scale defined as $\frac{1}{\langle u'u'(0)\rangle^2}\int_0^\infty \langle u'u'(\tau)\rangle^2 d\tau$. As has been argued in Ollitrault (1994), we can assume $\tilde{T} \approx T$ and $\tilde{N}_{df} = N_{df} = \frac{N}{10}$.

Remark that the above 95 % confidence interval for $\langle u'u'(0)\rangle$, may be approximated by $\overline{u'u'} \pm 1.96 \cdot \sqrt{\frac{2(\overline{u'u'})^2}{\tilde{N}_{df}}}$ if $\tilde{N}_{df}$ is large enough so that one can apply the central limit theorem. Since $\mathrm{var}(\overline{u'u'}) = \frac{2\langle u'u'(0)\rangle^2}{\tilde{N}_{df}}$ asymptotically, we have approximated $\mathrm{var}(\overline{u'u'})$ by $\frac{2 \cdot (\overline{u'u'})^2}{\tilde{N}_{df}}$ (see Appendix E in Ollitrault (1994) for a formal proof or recall that $\mathrm{var}\left(\chi_k^2\right) = 2k$ for an heuristic proof). Estimation of the 95 % confidence interval for $\langle v'v'(0)\rangle$ proceeds along the same lines.

We follow a similar procedure based on the central limit theorem to estimate the 95 % confidence interval for $\langle u'v'(0)\rangle$. One shows easily that it may be approximated by $\overline{u'v'} \pm 2 \cdot \sqrt{\frac{\overline{u'u'} \cdot \overline{v'v'}}{N \cdot \Delta} \cdot 2\tilde{T}_{uv}}$ or $\overline{u'v'} \pm 1.96 \cdot \sqrt{\frac{\overline{u'u'} \cdot \overline{v'v'} \cdot 2 \cdot 5}{N}}$ because we assume also that $2\tilde{T}_{uv} \approx 10$ days.

The 95 % interval on Eddy Kinetic Energy (EKE) is obtained as follows. EKE is defined by $\frac{1}{2}\left(\overline{u'^2} + \overline{v'^2}\right)$.

The assumed gaussian distribution of velocity components implies independence of the components when given in the principal reference frame that is where the covariance is zero. Of course $\frac{1}{2}\left(\overline{u'^2} + \overline{v'^2}\right) = \frac{1}{2}\left(\overline{\underline{u}'^2} + \overline{\underline{v}'^2}\right)$ where the underbar refers to the principal axes. Since, independence of $\underline{u}'$ and $\underline{v}'$ implies that $\underline{u}'^2$ and $\underline{v}'^2$ are also independent (cf. Mood, Graybill and Boes, 3rd ed., 1974, p.151), one has $\mathrm{var}\left(\underline{u}'^2 + \underline{v}'^2\right) = \mathrm{var}\left(\underline{u}'^2\right) + \mathrm{var}\left(\underline{v}'^2\right)$. Here the east and north velocity components are relative to the same time. Let us consider a non zero time lag, and assume that $\underline{u}'_l$ and $\underline{v}'_m$ are also independent (a most plausible result), then $\mathrm{cov}(\underline{u}'_l, \underline{v}'_m) = \mathrm{cov}(\underline{u}'^2_l, \underline{v}'^2_m) = 0$.

$$\text{Now, } \mathrm{var}(EKE) = \mathrm{var}\left(\frac{1}{2N}\sum_{i=1}^{N}\left(\underline{u}'^2_i + \underline{v}'^2_i\right)\right)$$

$$= \frac{1}{4}\left(\mathrm{var}\left(\frac{1}{N}\sum_{i=1}^{N}\underline{u}'^2_i\right) + \mathrm{var}\left(\frac{1}{N}\sum_{i=1}^{N}\underline{v}'^2_i\right) + 2\,\mathrm{cov}\left(\frac{1}{N}\sum_{i=1}^{N}\underline{u}'^2_i, \frac{1}{N}\sum_{i=1}^{N}\underline{v}'^2_i\right)\right).$$

The last term in the right hand side of the above expression is given by $2\frac{1}{N^2}\sum_{i=1}^{N}\sum_{j=1}^{N}\mathrm{cov}(\underline{u}'^2_i, \underline{v}'^2_j)$ (cf.Mood, Graybill and Boes, 3rd ed., 1974, p.179), which is zero because the individual covariances are all equal to zero (see above).

$$\text{Finally, } \mathrm{var}(EKE) = \frac{1}{4}\left(\mathrm{var}\left(\overline{\underline{u}'^2}\right) + \mathrm{var}\left(\overline{\underline{v}'^2}\right)\right)$$

$$= \frac{1}{4} \cdot \frac{2\left(\langle\underline{u}'^2\rangle^2 \cdot 2\tilde{T}_{\underline{uu}} + \langle\underline{v}'^2\rangle^2 \cdot 2\tilde{T}_{\underline{vv}}\right)}{N \cdot \Delta} \approx \frac{\left(\left(\overline{\underline{u}'^2}\right)^2 + \left(\overline{\underline{v}'^2}\right)^2\right) \cdot 5}{N}.$$

The 95 % confidence interval for EKE is thus the $\pm 1.96\sigma$ interval centered on the sample EKE value, where σ is given approximately by $\sqrt{\frac{5 \cdot \left(\left(\overline{\underline{u}'^2}\right)^2 + \left(\overline{\underline{v}'^2}\right)^2\right)}{N}}$.

More details about statistical estimation can be found in Ollitrault (1994).

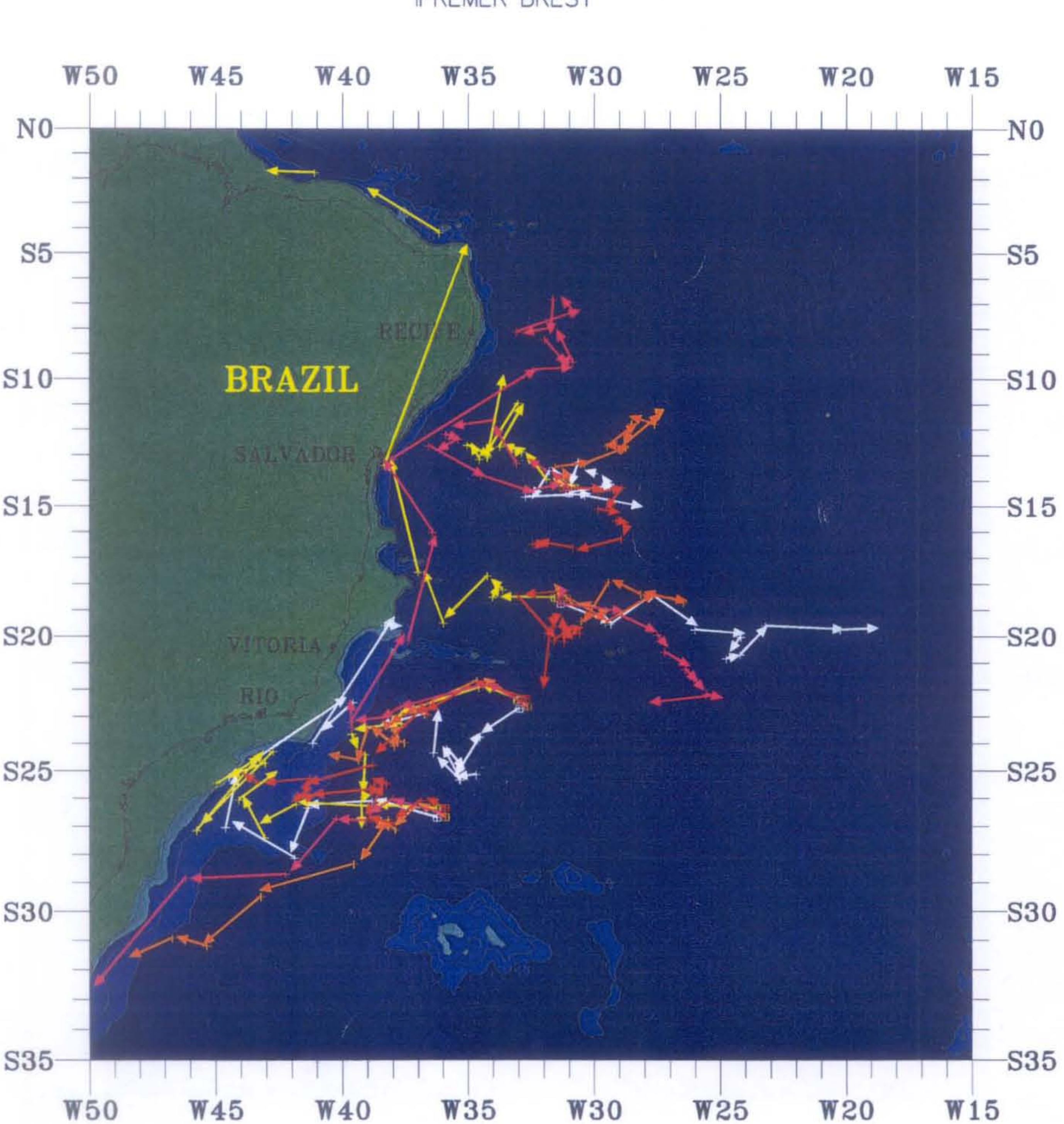


Figure 10 SAMBA1 MARVOR and ALACE displacements (February 1994 - August 1995). Vectors give the submerged displacements over the 60 days from the submergence point to the next surfacing position (tip of arrowhead).

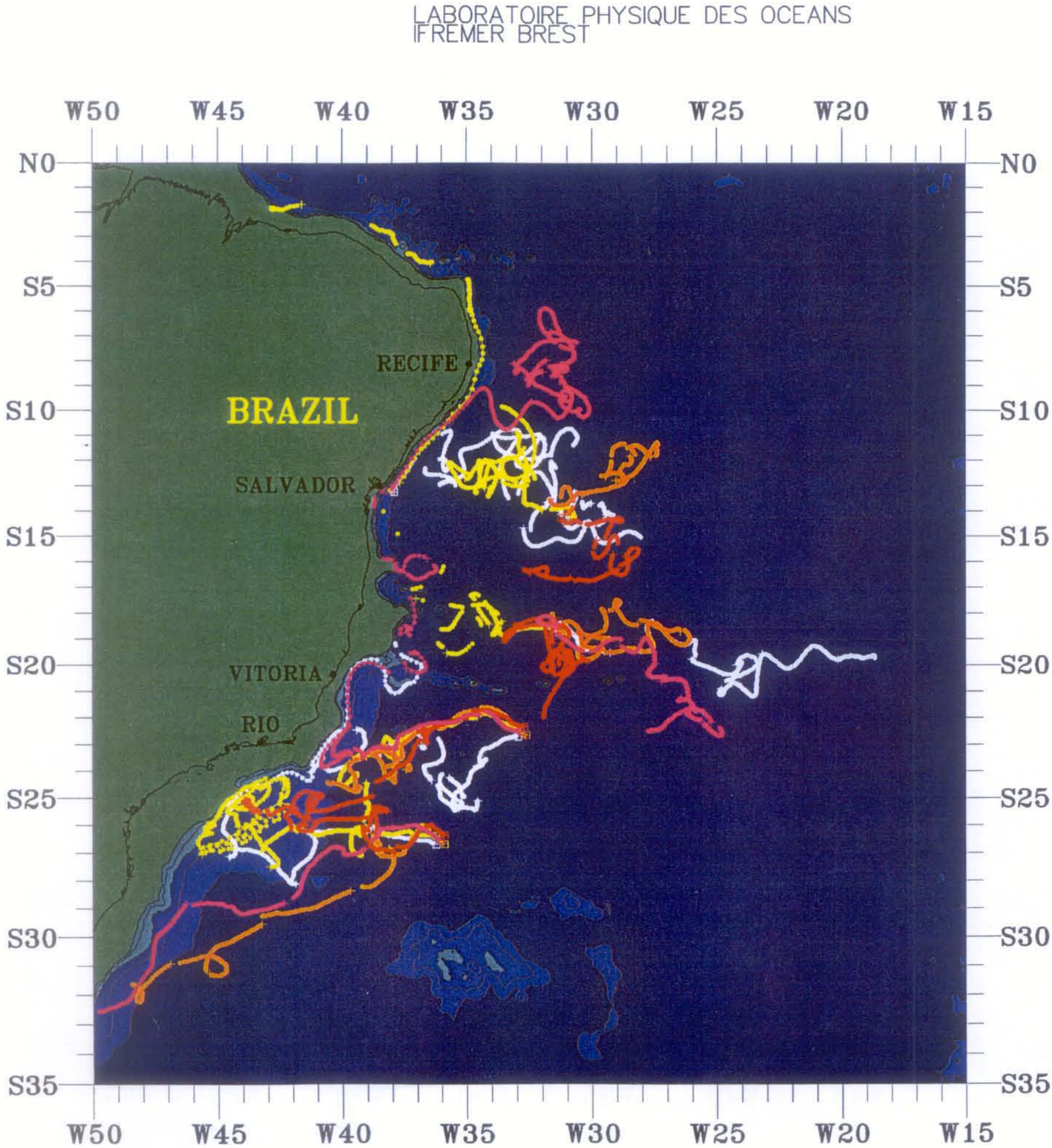
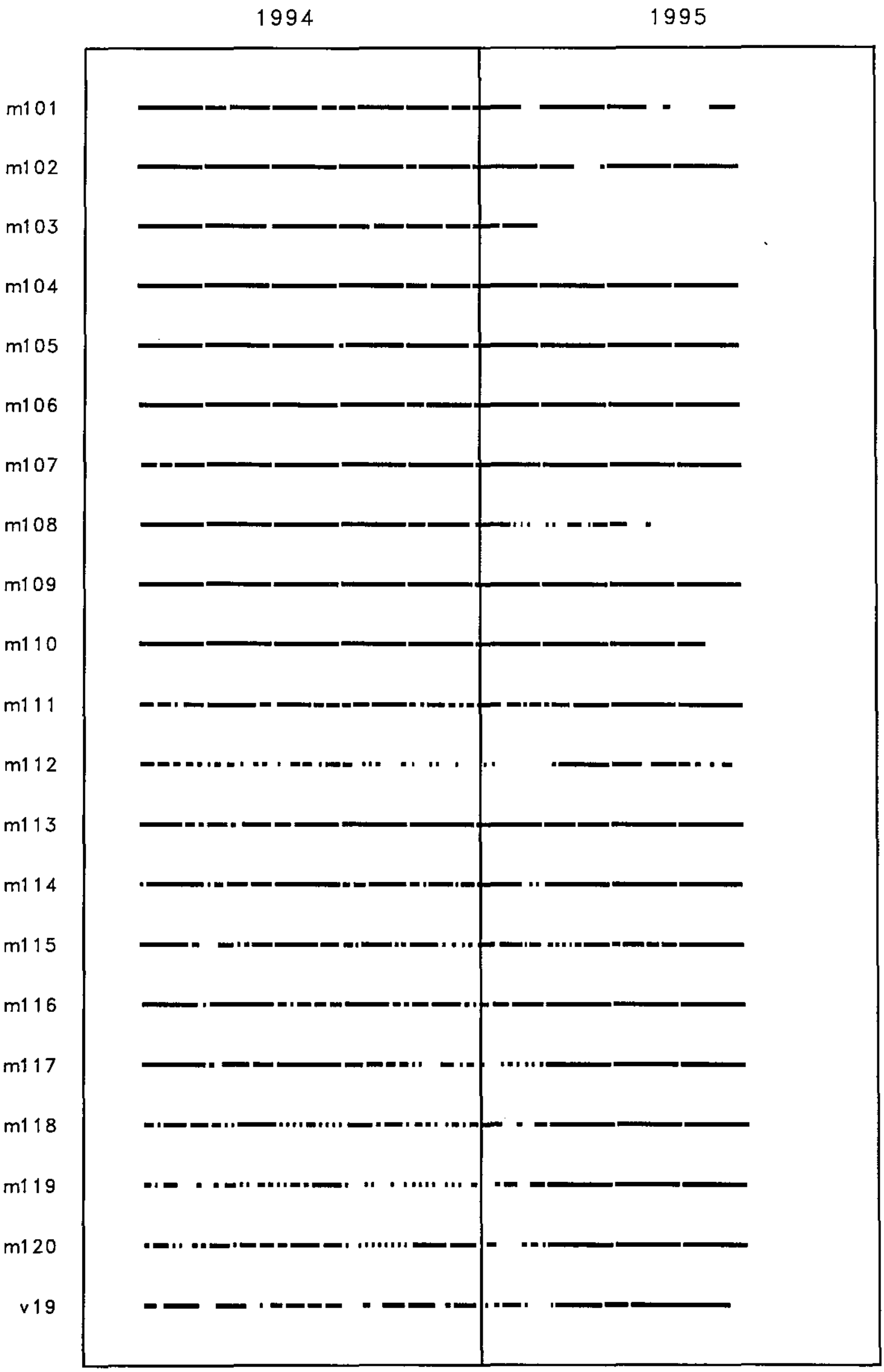


Figure 11 SAMBA1 MARVOR and VCM trajectories (February 1994 - August 1995). Dots give daily positions.



SAMBA1 FLOAT LIFETIMES

EXPERIMENT: SAMBA
FLOAT: MARVOR #101

LAUNCHED AT: 26°40.1'S 36°15.0'W on 18/02/1994 00h05 UT

Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

This float was entrained within the IWBC, after 10 months of roughly westward flow. 10 days were lost however at the end of cycle #6, due to an abnormal sinking (down to 1565 dbar). This float crossed the Vitoria-Trindade chain, flowing northward, at the westernmost passage, near the end of cycle #8, whence the float rising to 730 dbar (see the pressure time series). At the beginning of cycle #9, the pressure time series also showed a rising to 750 dbar, probably due to the float flowing over a bump (but not revealed by available bathymetric maps). During this last cycle, the float crossed once more the Vitoria-Trindade chain, northward, but at a passage to the east of the previous one.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m101-c1.raw	m101-c1.fin	m101-c1.diaric
m101-c2.raw	m101-c2.fin	m101-c2.diaric
m101-c3.raw	m101-c3.fin	m101-c3.diaric
m101-c4.raw	m101-c4.fin	m101-c4.diaric
m101-c5.raw	m101-c5.fin	m101-c5.diaric
m101-c6.raw	m101-c6.fin	m101-c6.diaric
m101-c7.raw	m101-c7.fin	m101-c7.diaric
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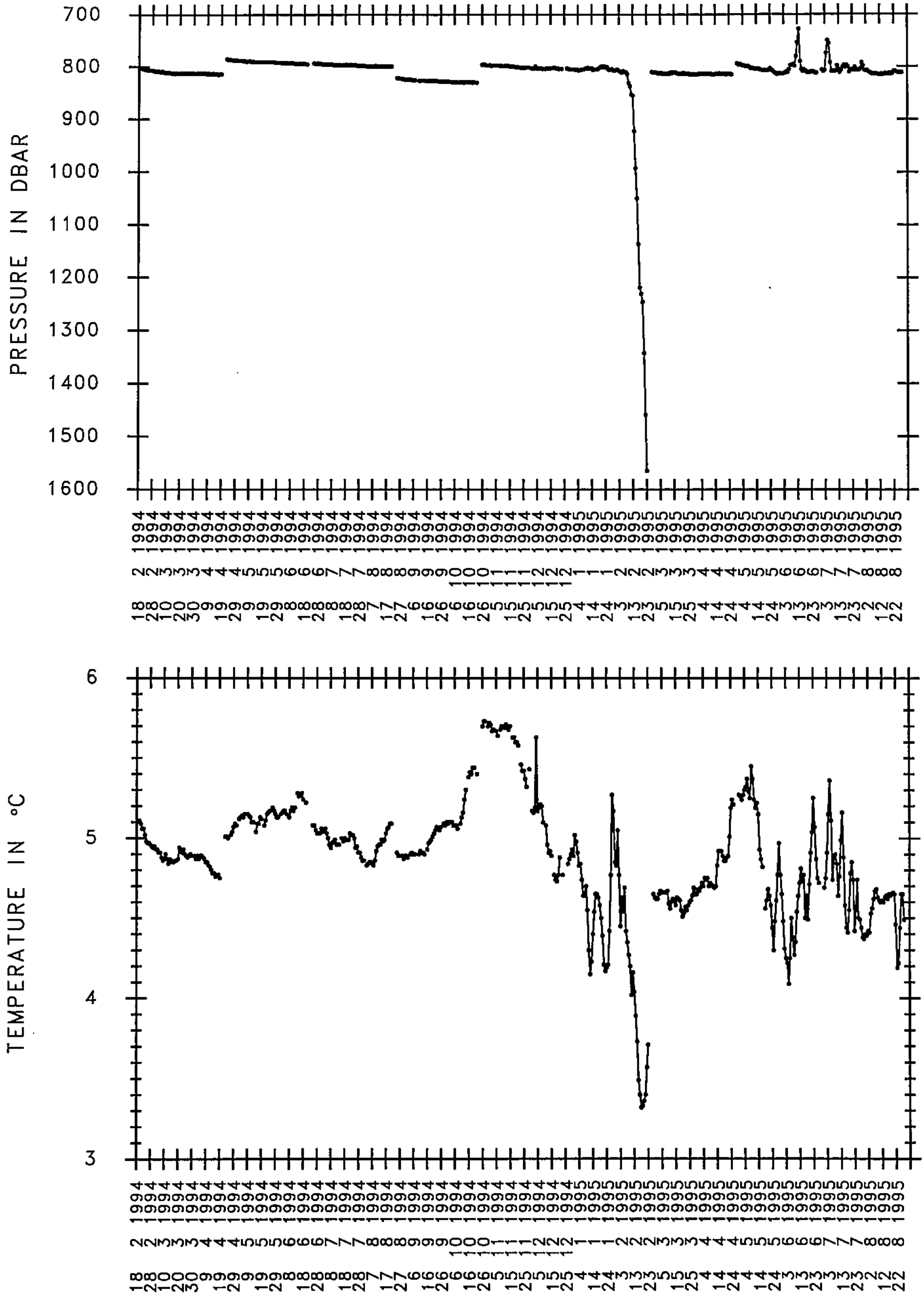
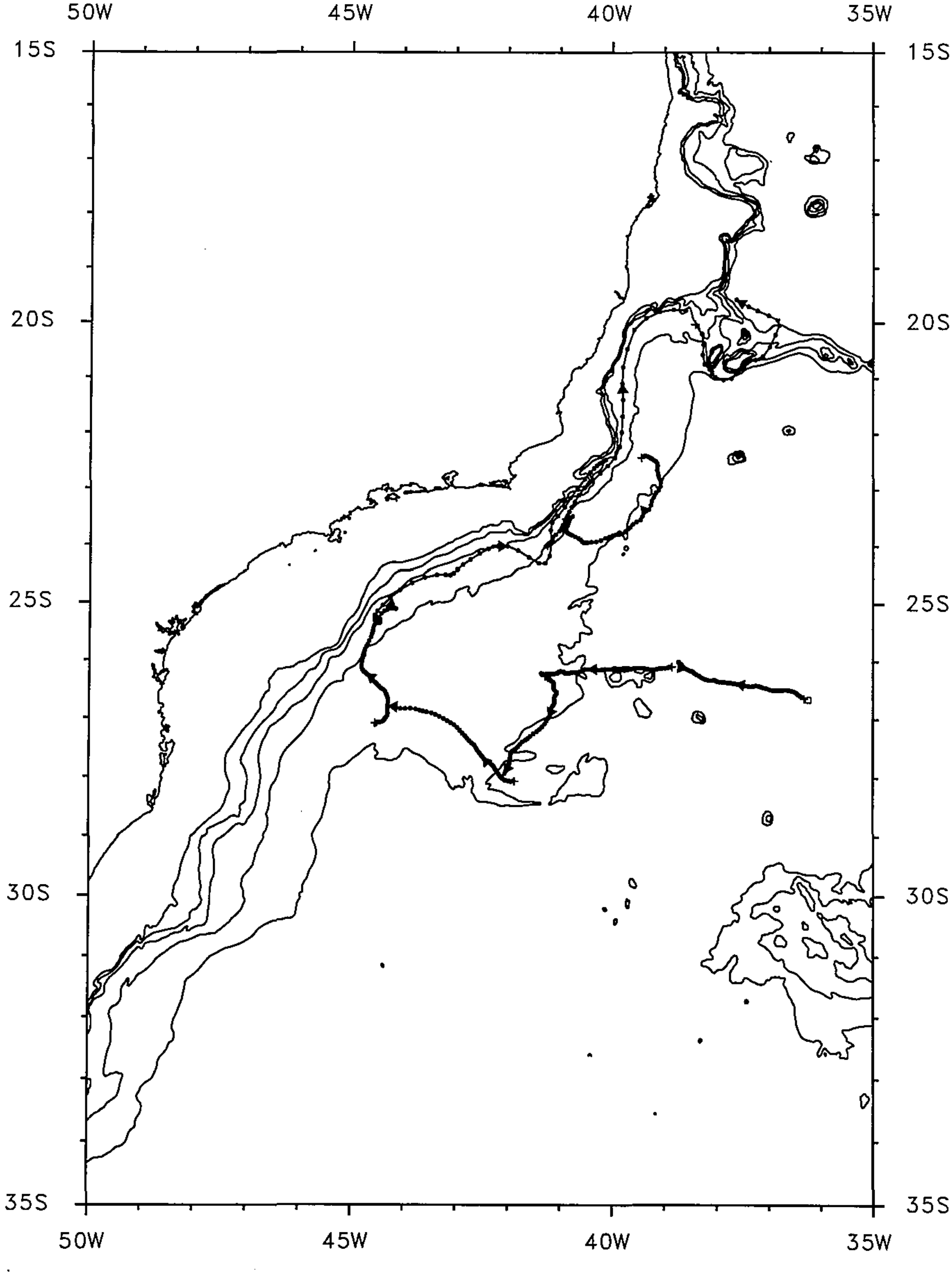
m101-c9.raw	m101-c9.fin	m101-c9.diaric



SAMBA M101 CYCLES 1 TO 9



SAMBA M101 (FEBRUARY 1994 – AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m101

launch date	launch lat	launch long
1994 2 18 0h UT	26.668 S	36.250 W

file	m101-c1.fin	m101-c2.fin	m101-c3.fin
date of 1st pos	1994 2 19 (16121)	1994 4 22 (16183)	1994 6 23 (16245)
1st pos	36.324W 26.649S	38.859W 26.100S	41.289W 26.264S
last pos	38.734W 26.014S	41.363W 26.218S	42.066W 27.940S
1st P and T	803dbar 5.11degC	785dbar 5.01degC	793dbar 5.08degC
last P and T	814dbar 4.75degC	795dbar 5.22degC	799dbar 5.09degC
displacements (East and North)	-240km 71km	-250km -13km	-77km -186km
mean velocities (East and North)	-4.71cm/s 1.38cm/s	-4.90cm/s -0.26cm/s	-1.51cm/s -3.65cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.67 cm/s [-4.97, -2.37]
average north velocity comp.= -0.82 cm/s [-2.07, 0.42]

variances
variance of east velocity comp.= 6.89 cm2/s2 [2.39, 11.39]
variance of north velocity comp.= 6.31 cm2/s2 [2.19, 10.43]

covariance
covariance= -1.99 cm2/s2 [-5.03, 1.06]

Eddy Kinetic Energy
EKE= 6.60 cm2/s2 [3.55, 9.65]

Temperature time series statistics:

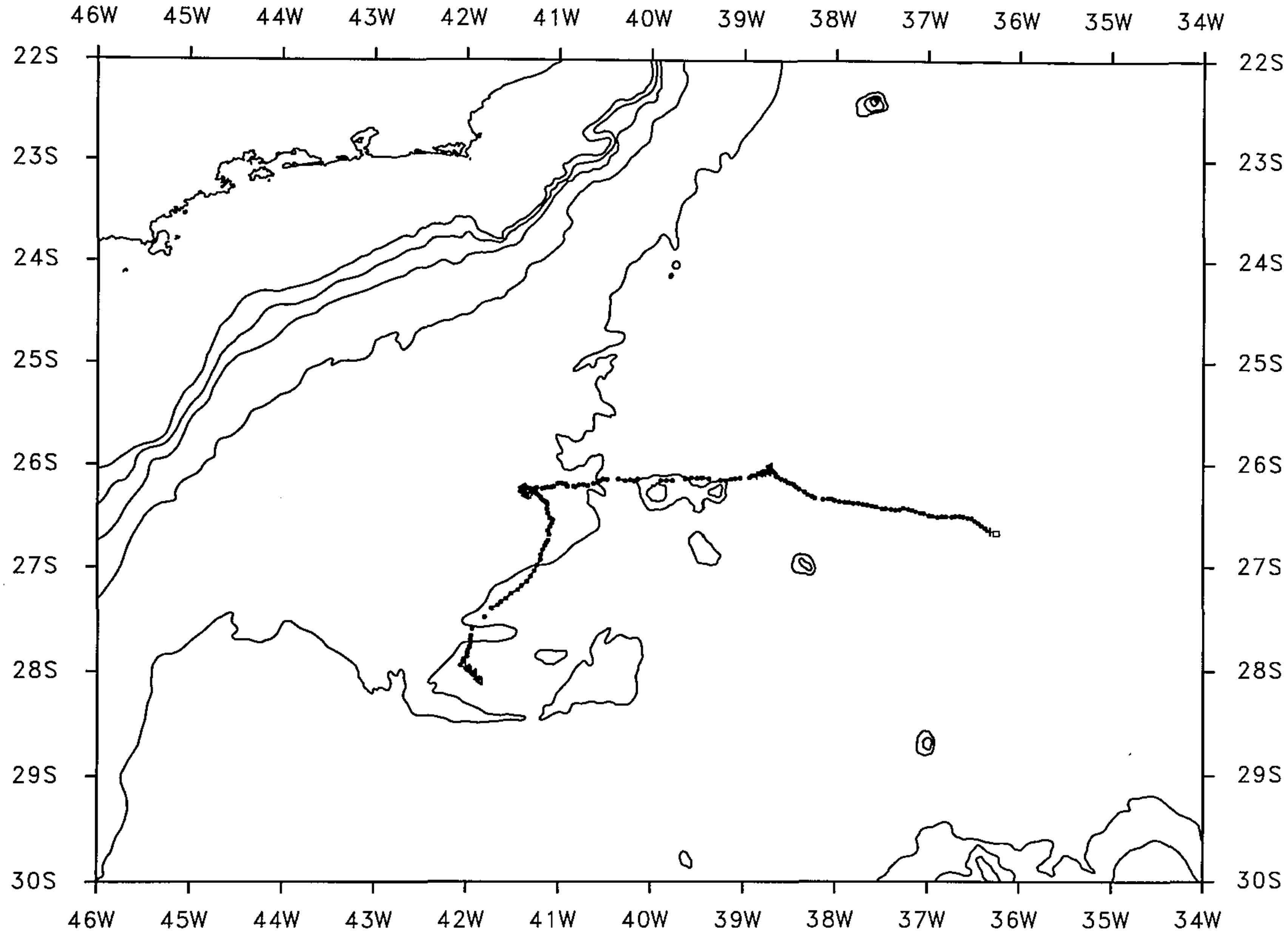
sampling interval= 24 h
number of samples= 162

average temperature= 4.99 degC

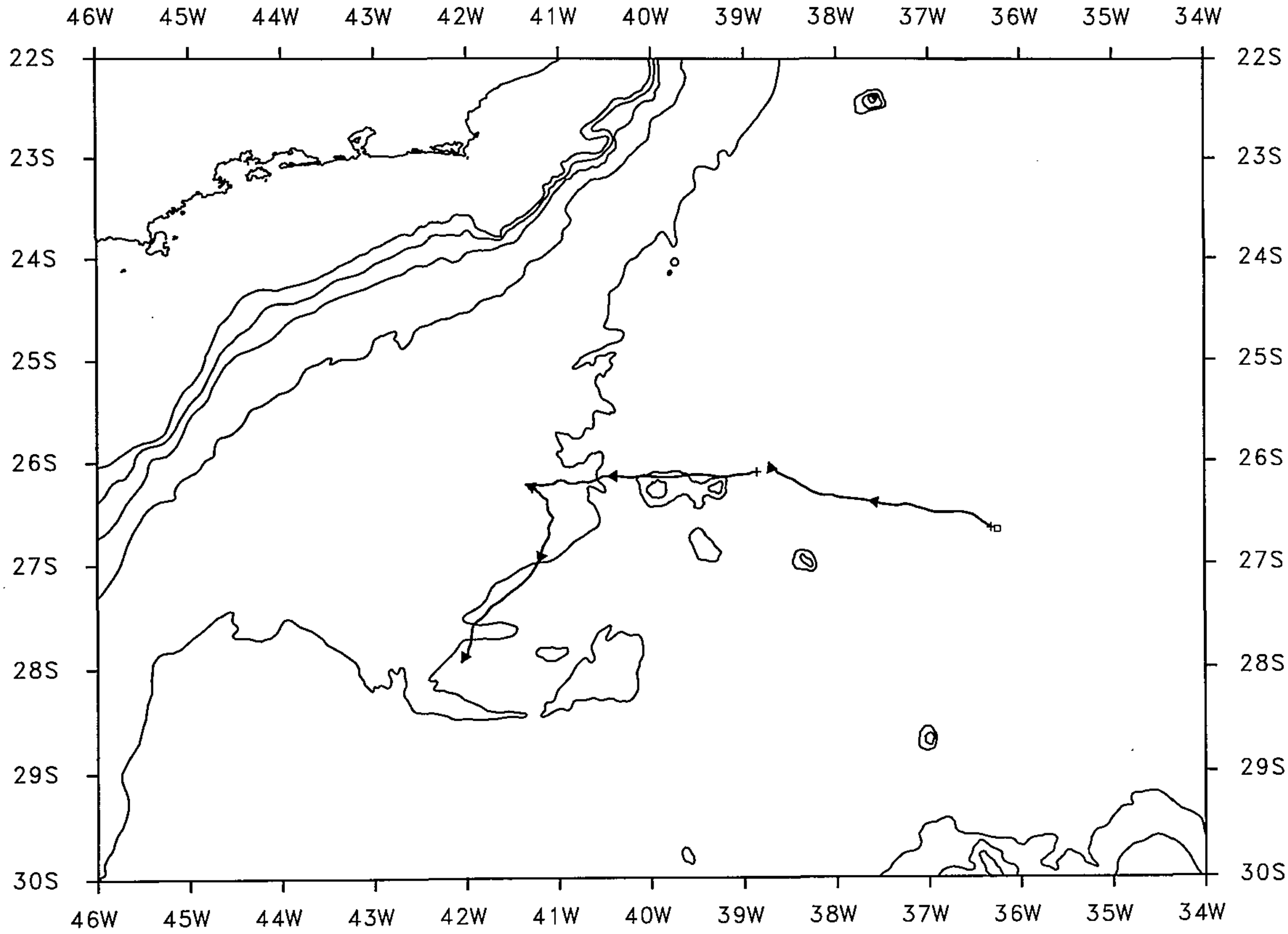
temperature variance= 0.0147 degC*degC

covar(u,temp)= -0.01 cm.degC/s
covar(v,temp)= -0.02 cm.degC/s

Comments:

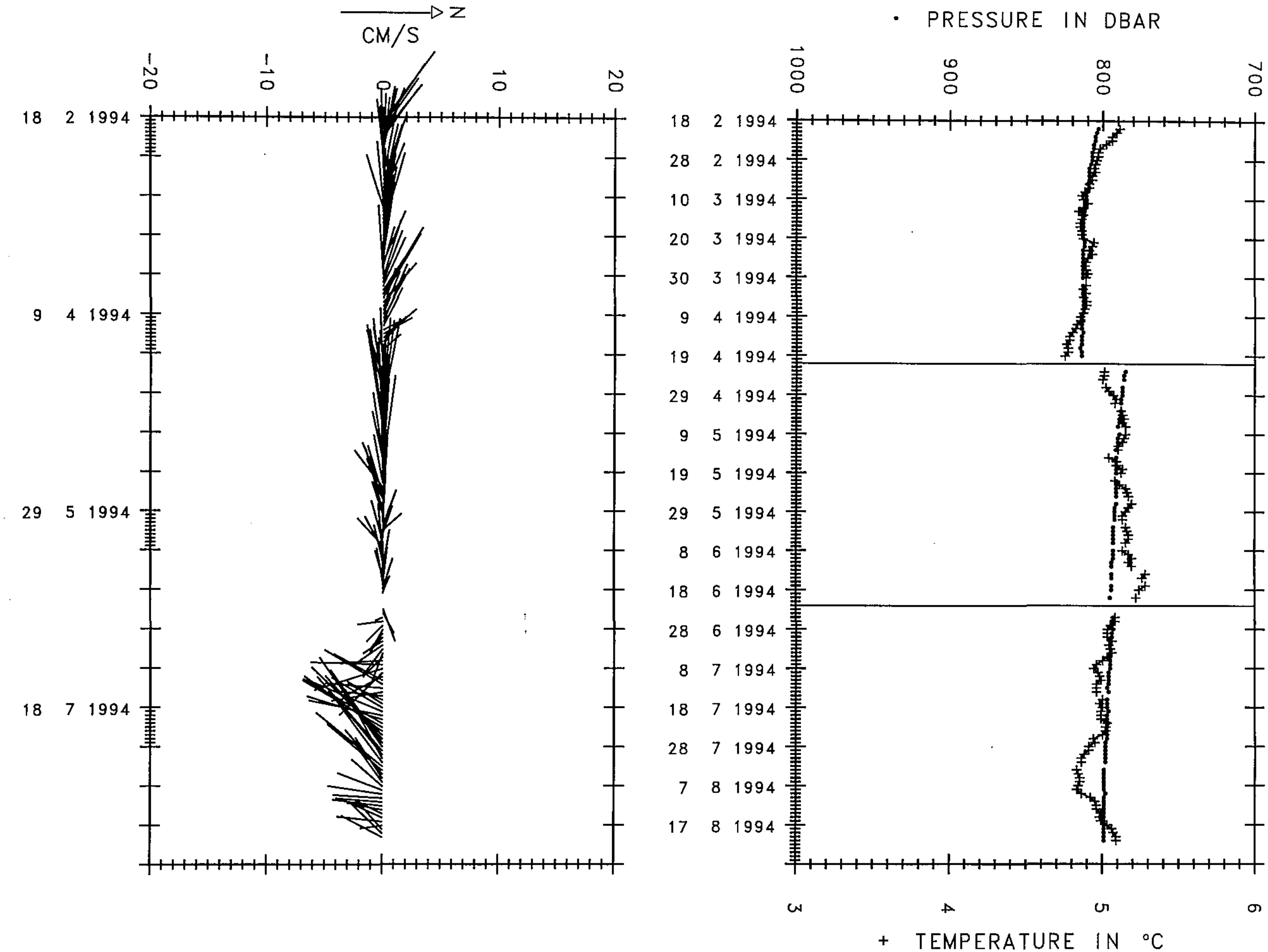


SAMBA M101 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M101 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED

SAMBA M101 CYCLES 1,2 AND 3



EXPERIMENT: SAMBA

FLOAT: m101

launch date	launch lat	launch long
1994 2 18 0h UT	26.668 S	36.250 W

file	m101-c4.fin	m101-c5.fin	m101-c6.fin
date of 1st pos	1994 8 24 (16307)	1994 10 25 (16369)	1994 12 26 (16431)
1st pos	41.874W 28.069S	44.547W 27.082S	44.515W 25.270S
last pos	44.299W 26.795S	44.156W 25.101S	40.125W 22.469S
1st P and T	821dbar 4.91degC	796dbar 5.70degC	803dbar 4.84degC
last P and T	830dbar 5.40degC	804dbar 4.77degC	1565dbar 3.71degC
displacements (East and North)	-239km 142km	39km 220km	446km 311km
mean velocities (East and North)	-4.69cm/s 2.78cm/s	0.77cm/s 4.32cm/s	10.54cm/s 7.35cm/s
number of pos	60	60	50

Velocity time series statistics:

sampling interval= 24 h
number of samples= 170

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 1.67 cm/s [-2.58, 5.93]
average north velocity comp.= 4.58 cm/s [1.53, 7.62]

variances
variance of east velocity comp.= 69.13 cm2/s2 [22.66, 115.61]
variance of north velocity comp.= 35.40 cm2/s2 [11.60, 59.19]

covariance
covariance= 13.44 cm2/s2 [-10.08, 36.96]

Eddy Kinetic Energy
EKE= 52.27 cm2/s2 [26.16, 78.37]

Temperature time series statistics:

sampling interval= 24 h
number of samples= 145

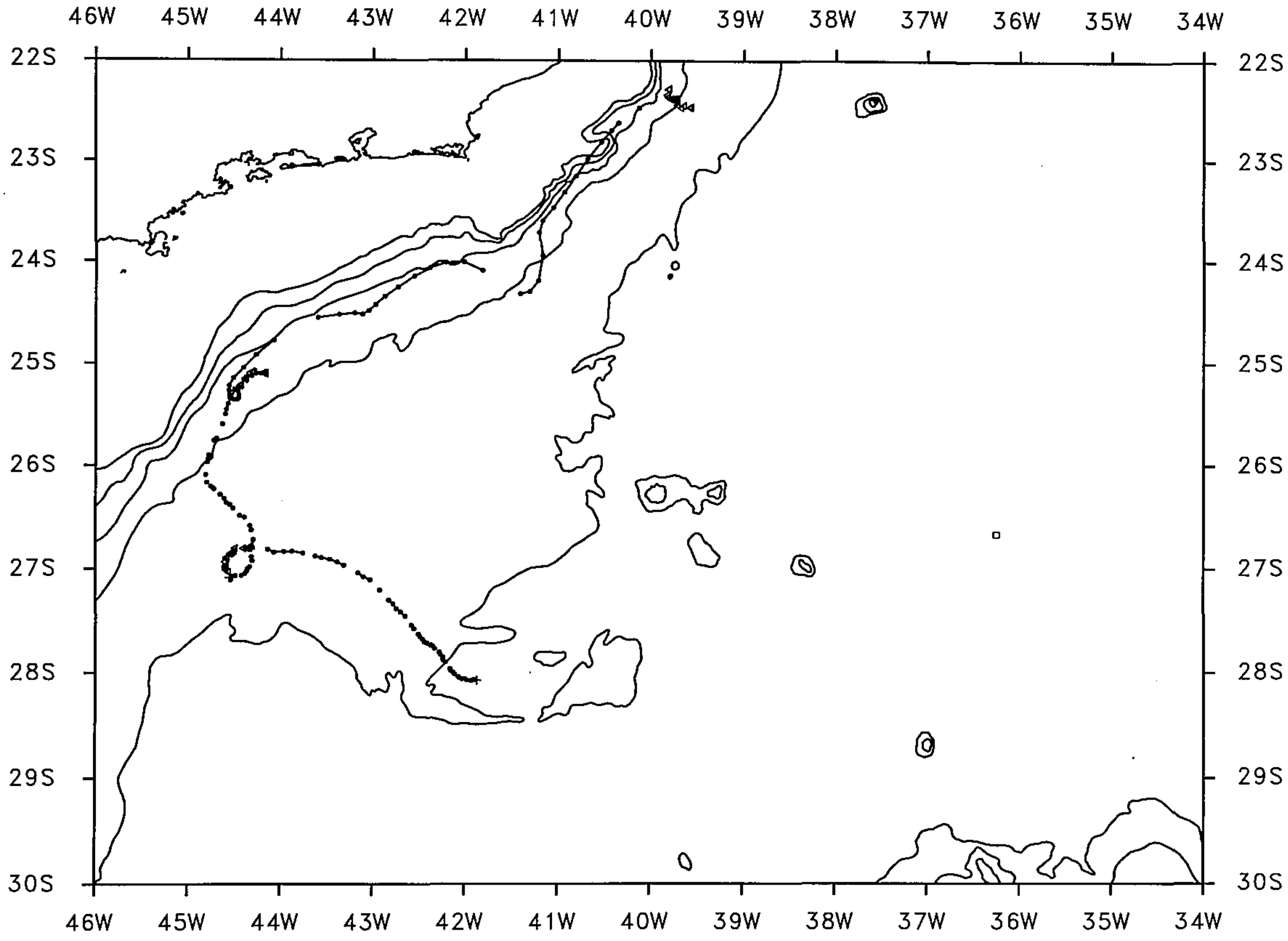
average temperature= 5.00 degC

temperature variance= 0.1826 degC*degC

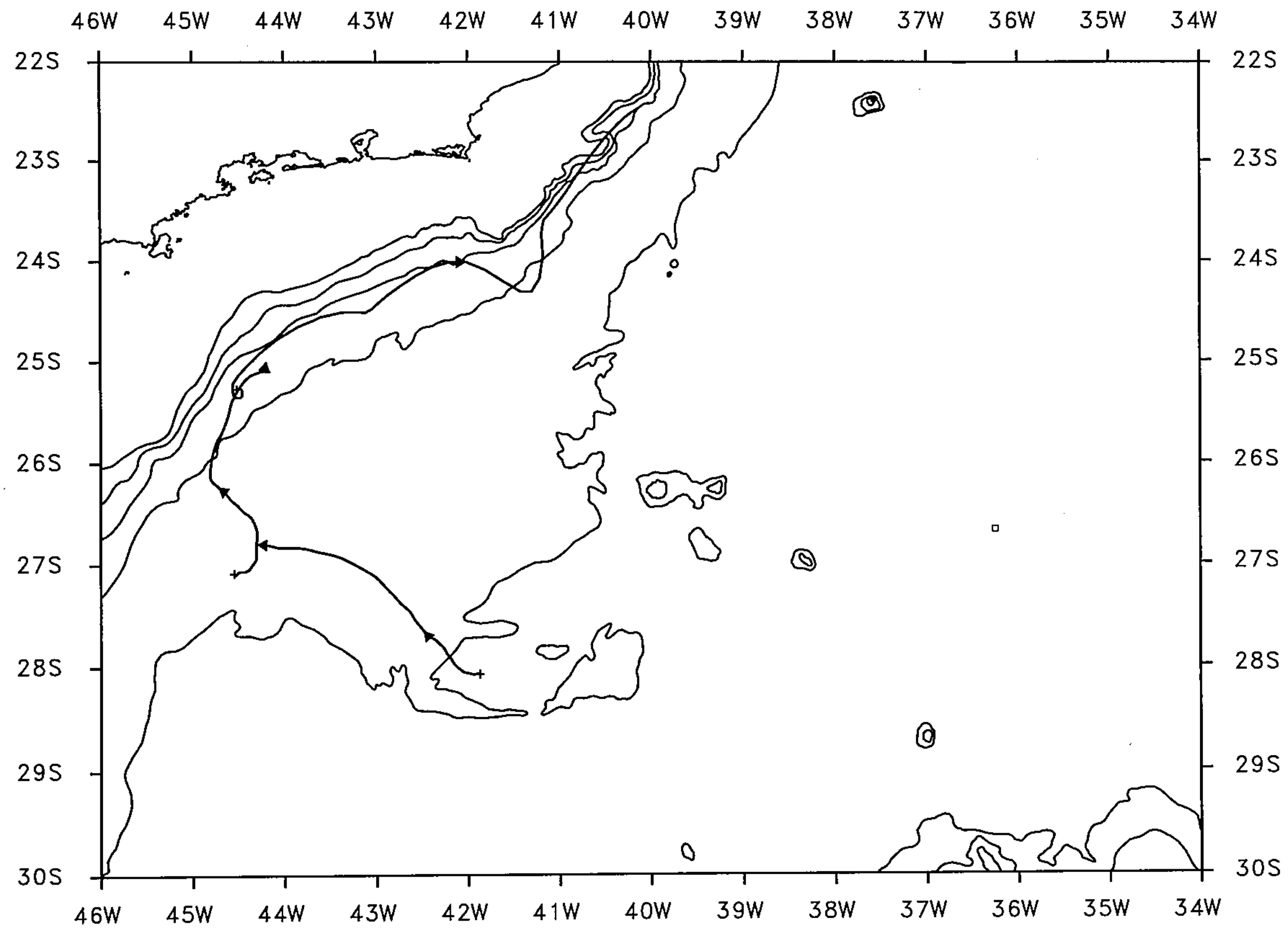
covar(u,temp)= -2.34 cm.degC/s
covar(v,temp)= -0.36 cm.degC/s

Comments:

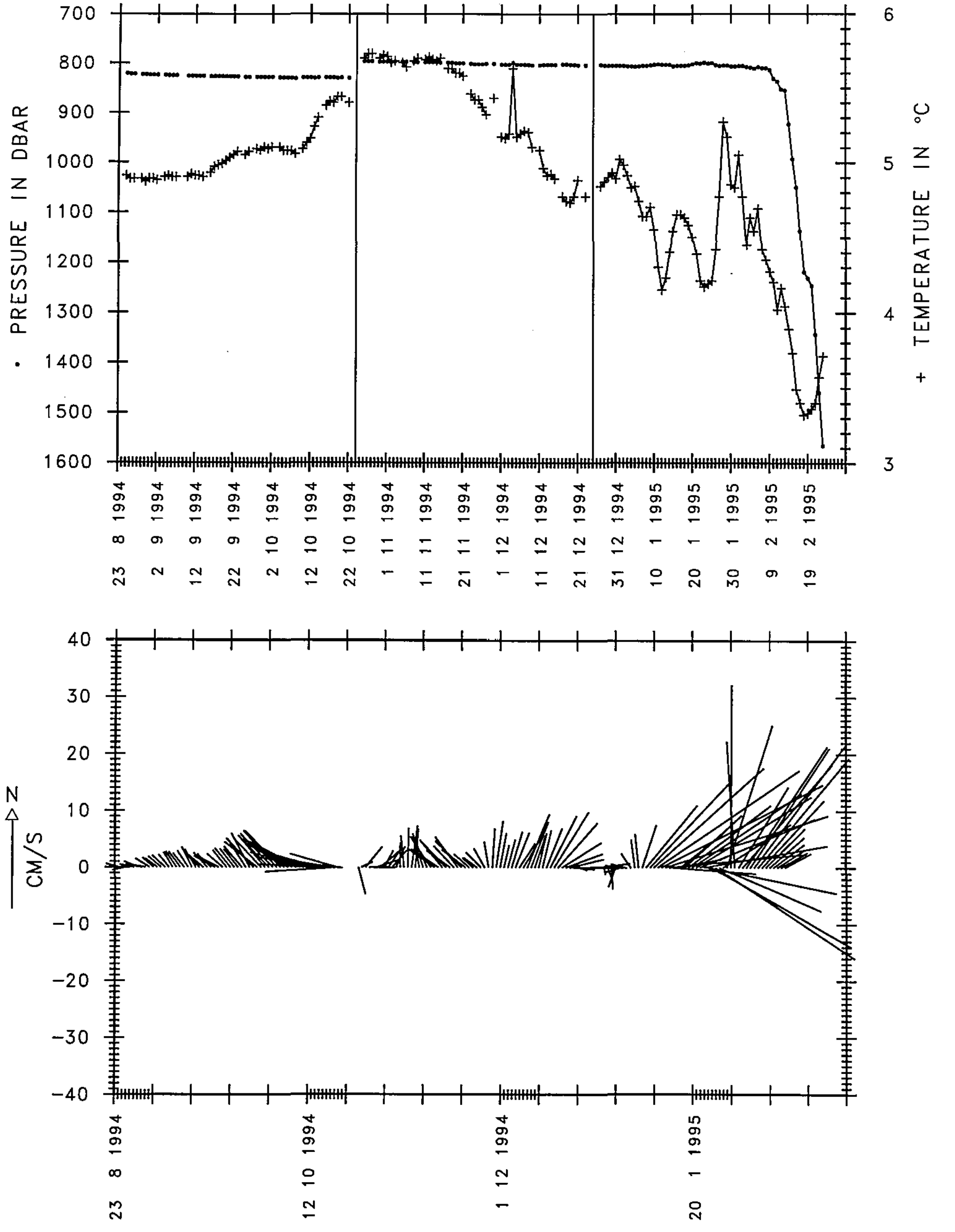
Velocity and temperature time series statistics are estimated from data within the [700,900] dbar interval.



SAMBA M101 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M101 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M101 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m101
----

launch date	launch lat	launch long
1994 2 18 0h UT	26.668 S	36.250 W

file	m101-c7.fin	m101-c8.fin	m101-c9.fin
date of 1st pos	1995 2 26 (16493)	1995 4 29 (16555)	1995 8 2 (16650)
1st pos	39.436W 22.437S	41.254W 23.997S	38.421W 20.028S
last pos	40.775W 23.478S	37.872W 19.153S	37.636W 19.577S
1st P and T	810dbar 4.65degC	794dbar 5.27degC	806dbar 4.69degC
last P and T	815dbar 5.21degC	812dbar 4.72degC	811dbar 4.49degC
displacements (East and North)	-137km -116km	349km 538km	82km 50km
mean velocities (East and North)	-2.69cm/s -2.27cm/s	6.97cm/s 10.74cm/s	3.65cm/s 2.23cm/s
number of pos	60	44	27

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 131

13 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 2.06 cm/s [-3.75, 7.87]
average north velocity comp.= 3.62 cm/s [-3.85, 11.09]

variances
variance of east velocity comp.= 93.96 cm2/s2 [21.73, 166.19]
variance of north velocity comp.= 155.34 cm2/s2 [35.92, 274.76]

covariance
covariance= 31.19 cm2/s2 [-34.48, 96.86]

Eddy Kinetic Energy
EKE= 124.65 cm2/s2 [54.86, 194.43]

Temperature time series statistics:
----

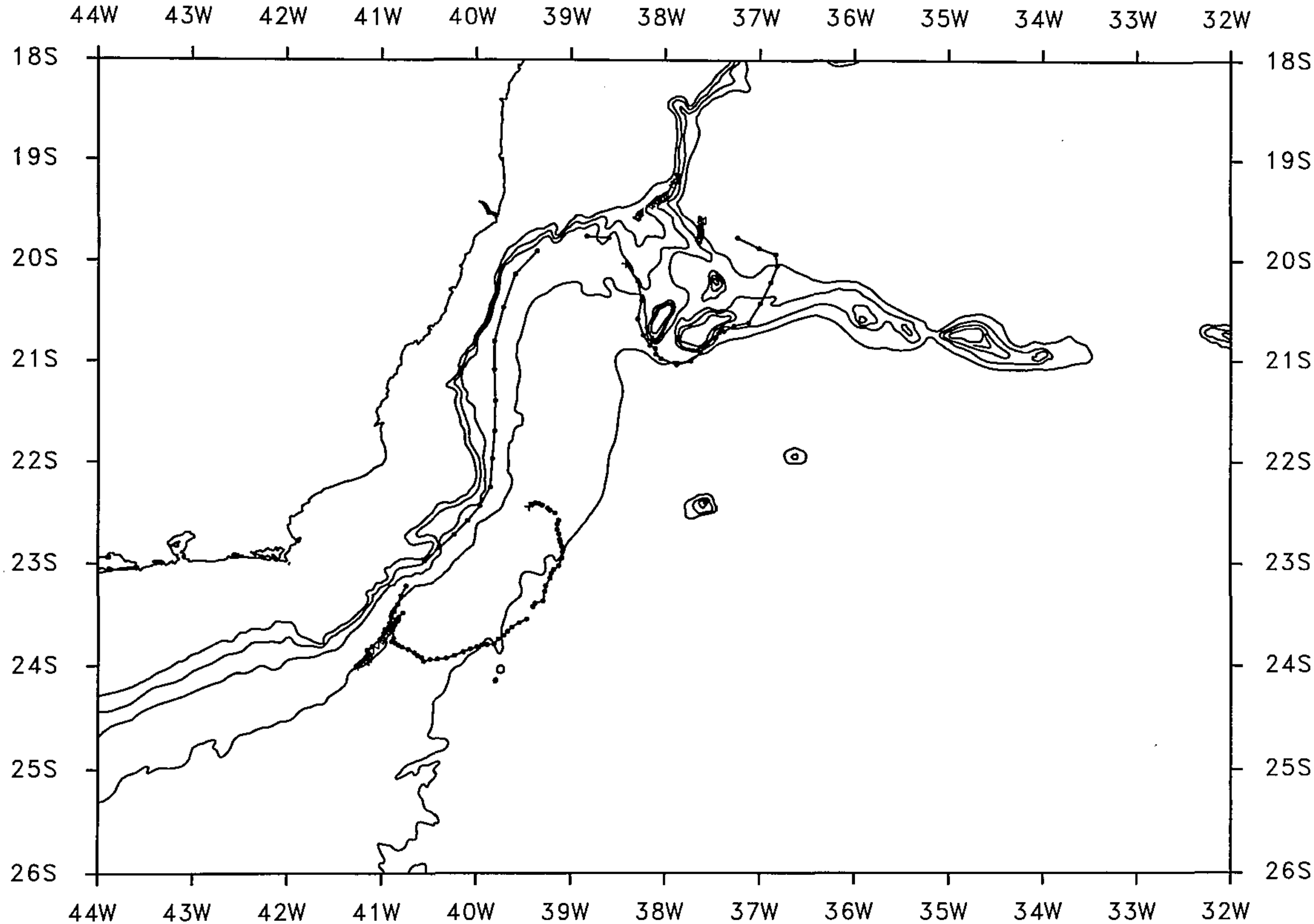
sampling interval= 24 h
number of samples= 128

average temperature= 4.74 degC

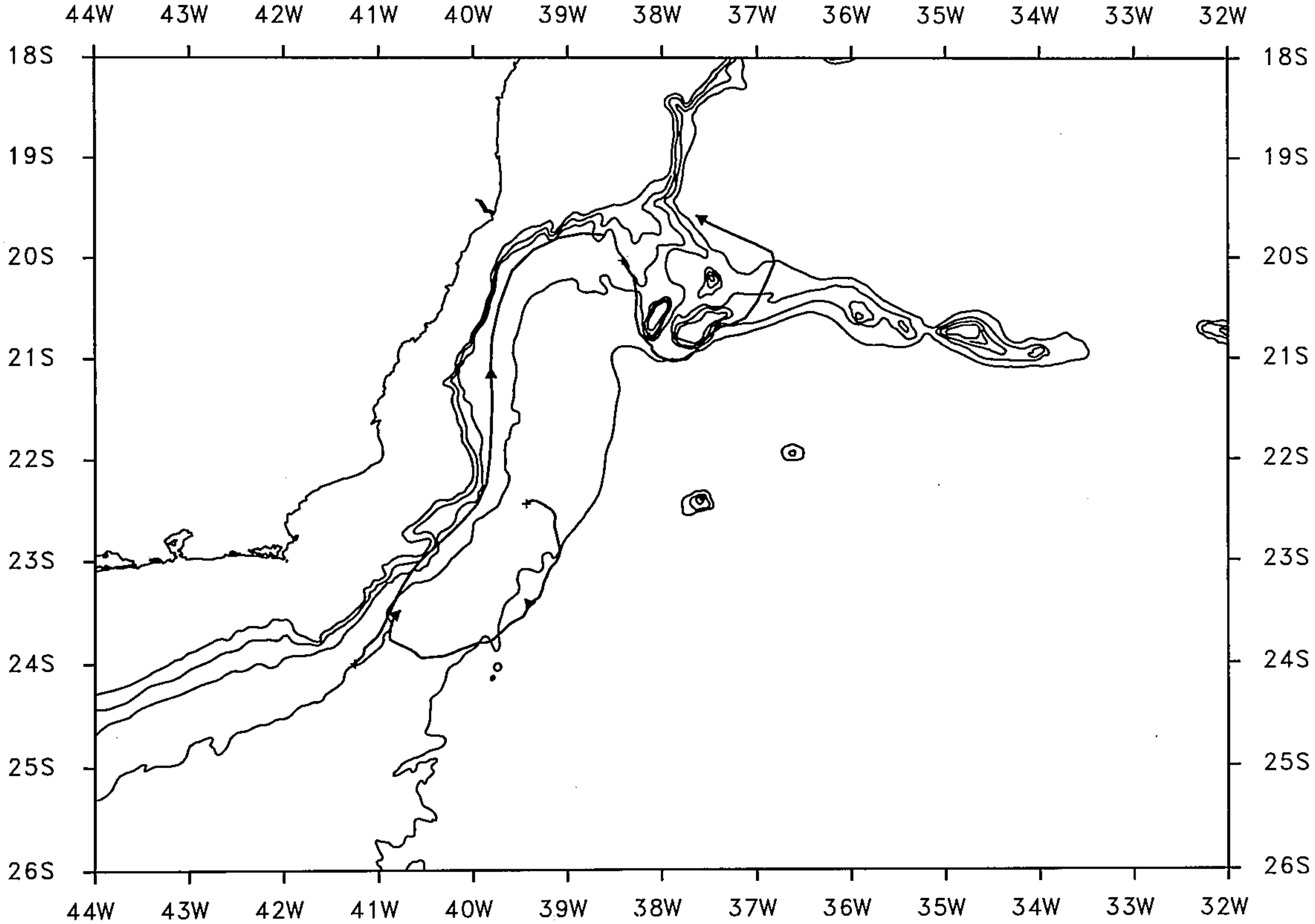
temperature variance= 0.0717 degC*degC

covar(u,temp)= -0.19 cm.degC/s
covar(v,temp)= 0.21 cm.degC/s

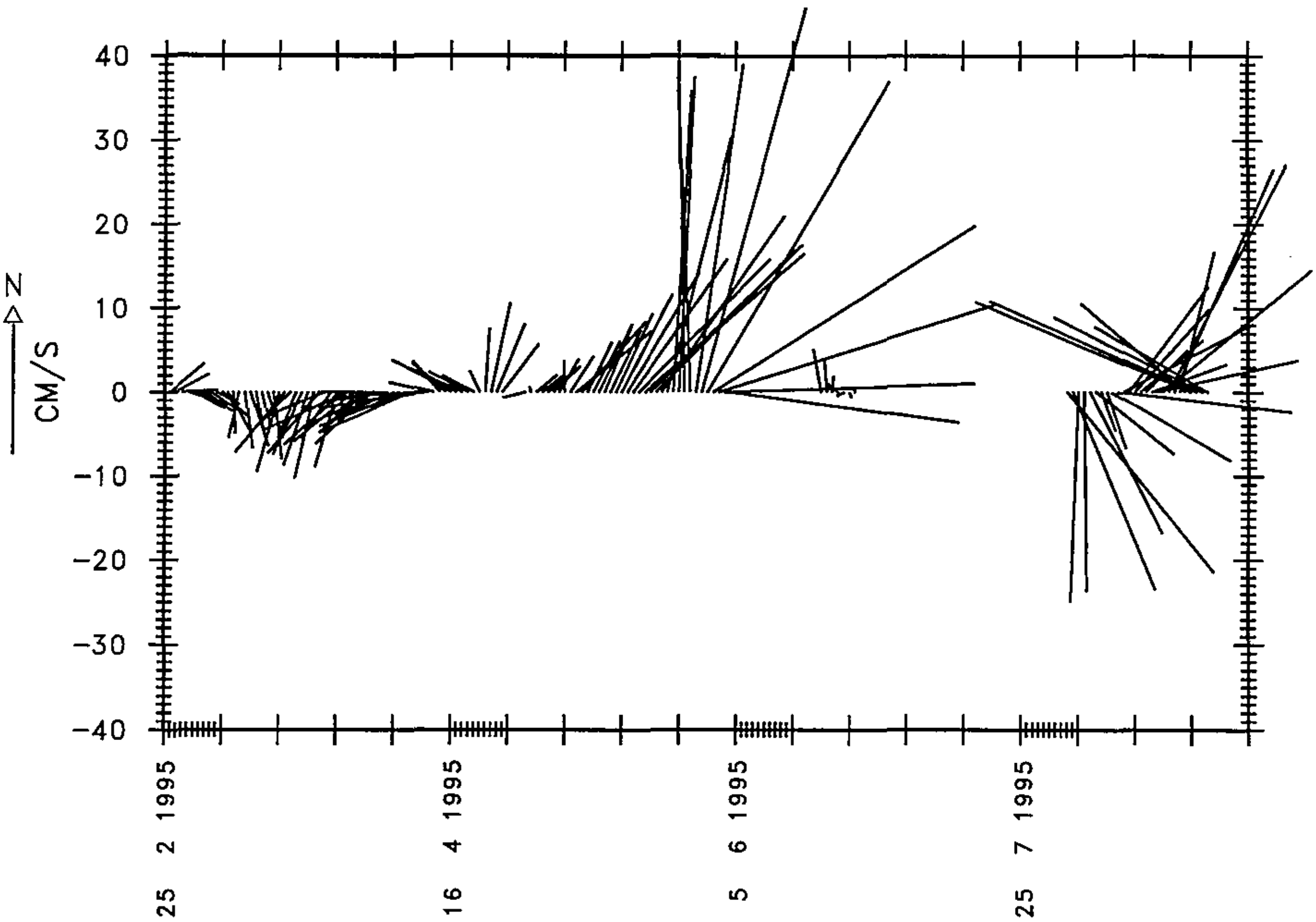
Comments:



SAMBA M101 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M101 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M101 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #102

LAUNCHED AT: 26°21.0'S 36°15.9'W on 18/02/1994 02h08 UT

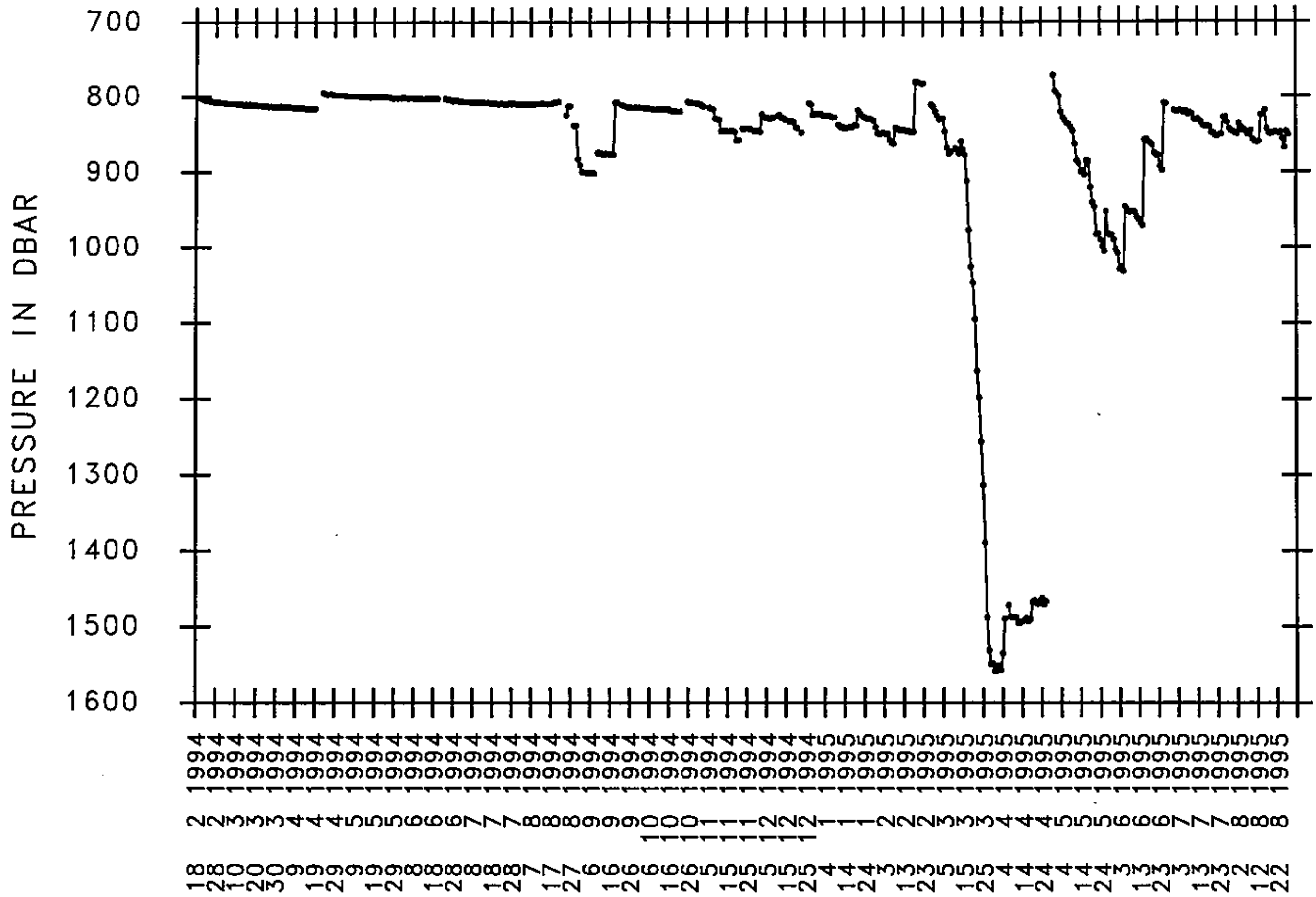
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

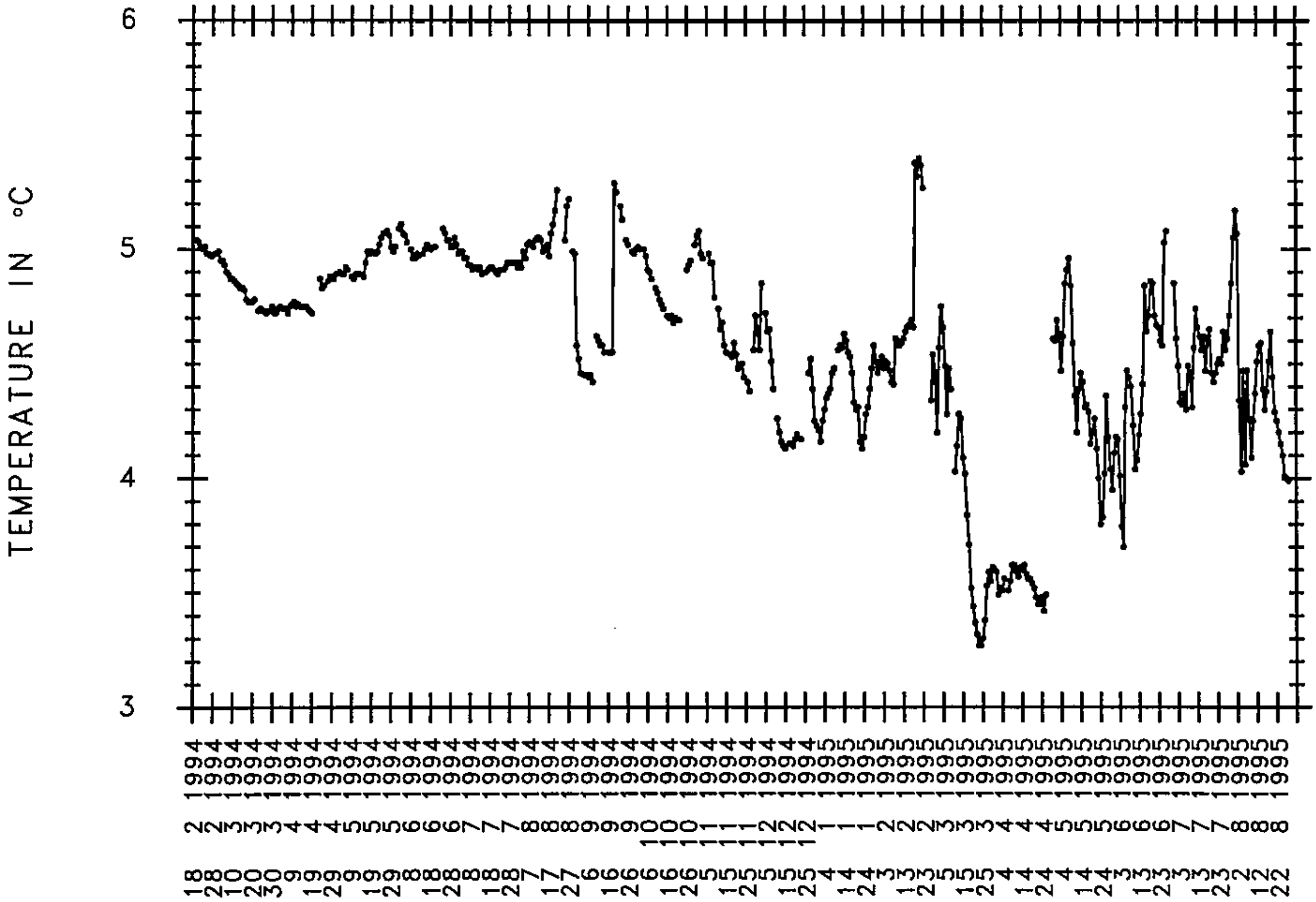
Comments

This float was entrained within the IWBC, after 9 months of roughly westward flow. For the next 9 months it was several times detrained from the IWBC and recirculate back offshore to be entrained again within the IWBC. The estimated width of the IWBC near 25°S, 46°W is thus of the order of 50 km.
During its seventh cycle, the float dramatically sank to 1500 dbar. During its eighth cycle, it also deepened abnormally, down to 1000 dbar. As a consequence the float was deeper than 900 dbar for a total of 70 days.

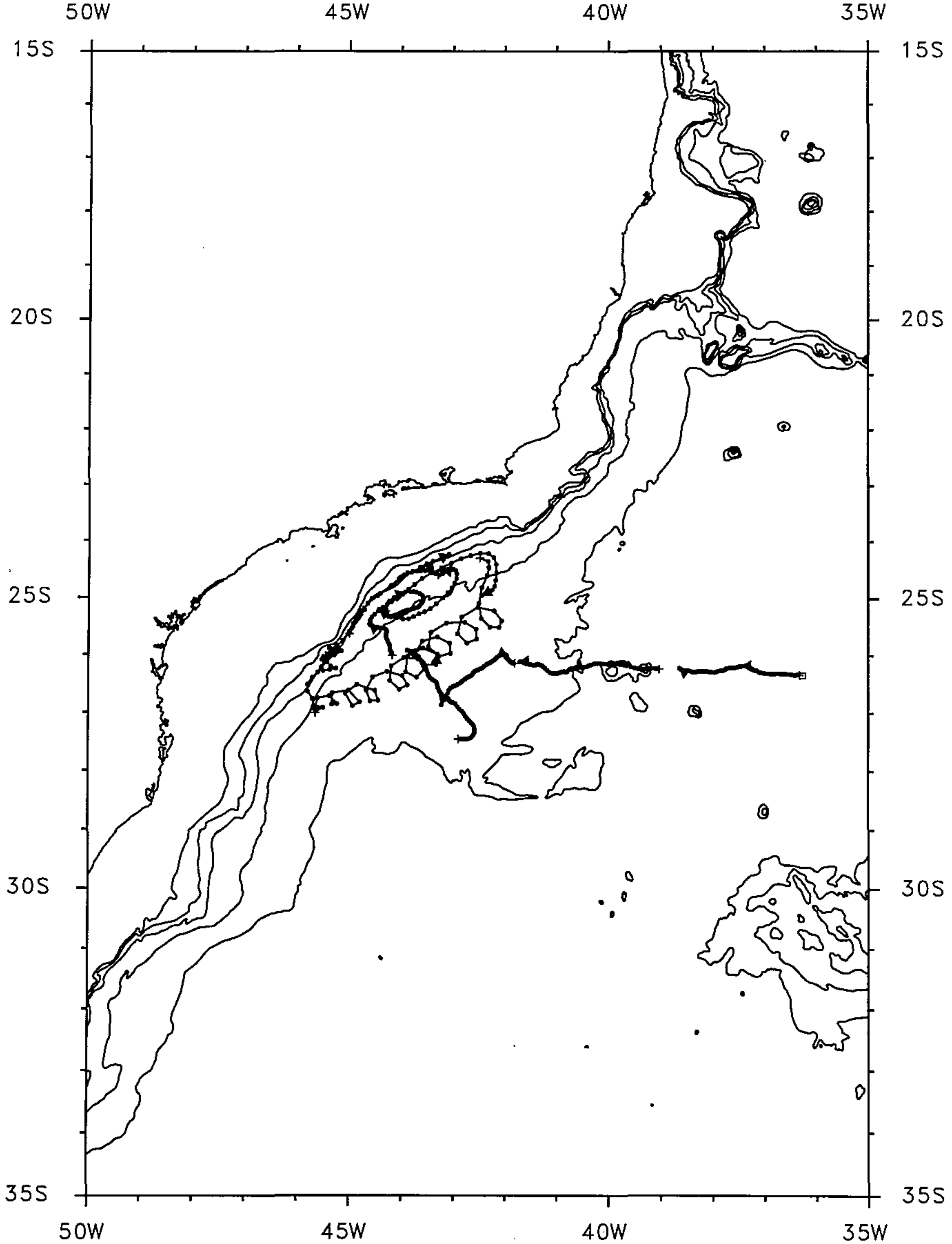
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m102-c1.raw	m102-c1.fin	m102-c1.diaric
m102-c2.raw	m102-c2.fin	m102-c2.diaric
m102-c3.raw	m102-c3.fin	m102-c3.diaric
m102-c4.raw	m102-c4.fin	m102-c4.diaric
m102-c5.raw	m102-c5.fin	m102-c5.diaric
m102-c6.raw	m102-c6.fin	m102-c6.diaric
m102-c7.raw	m102-c7.fin	m102-c7.diaric
m102-c8.raw	m102-c8.fin	m102-c8.diaric
m102-c9.raw	m102-c9.fin	m102-c9.diaric





SAMBA M102 CYCLES 1 TO 9



SAMBA M102 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m102
----

launch date	launch lat	launch long
1994 2 18 2h UT	26.350 S	36.265 W

file	m102-c1.fin	m102-c2.fin	m102-c3.fin
date of 1st pos	1994 2 19 (16121)	1994 4 22 (16183)	1994 6 23 (16245)
1st pos	36.326W 26.341S	39.032W 26.238S	41.810W 26.141S
last pos	38.642W 26.225S	41.717W 26.118S	43.228W 26.865S
1st P and T	802dbar 5.04degC	795dbar 4.87degC	803dbar 5.09degC
last P and T	816dbar 4.72degC	803dbar 5.01degC	807dbar 5.26degC
displacements (East and North)	-231km 13km	-268km 13km	-141km -80km
mean velocities (East and North)	-4.53cm/s 0.25cm/s	-5.25cm/s 0.26cm/s	-2.77cm/s -1.58cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -4.18 cm/s [-5.12, -3.23]
average north velocity comp.= -0.37 cm/s [-1.43, 0.70]

variances
variance of east velocity comp.= 3.64 cm2/s2 [1.26, 6.02]
variance of north velocity comp.= 4.61 cm2/s2 [1.60, 7.62]

covariance
covariance= 0.04 cm2/s2 [-1.85, 1.93]

Eddy Kinetic Energy
EKE= 4.12 cm2/s2 [2.21, 6.04]

Temperature time series statistics:
----

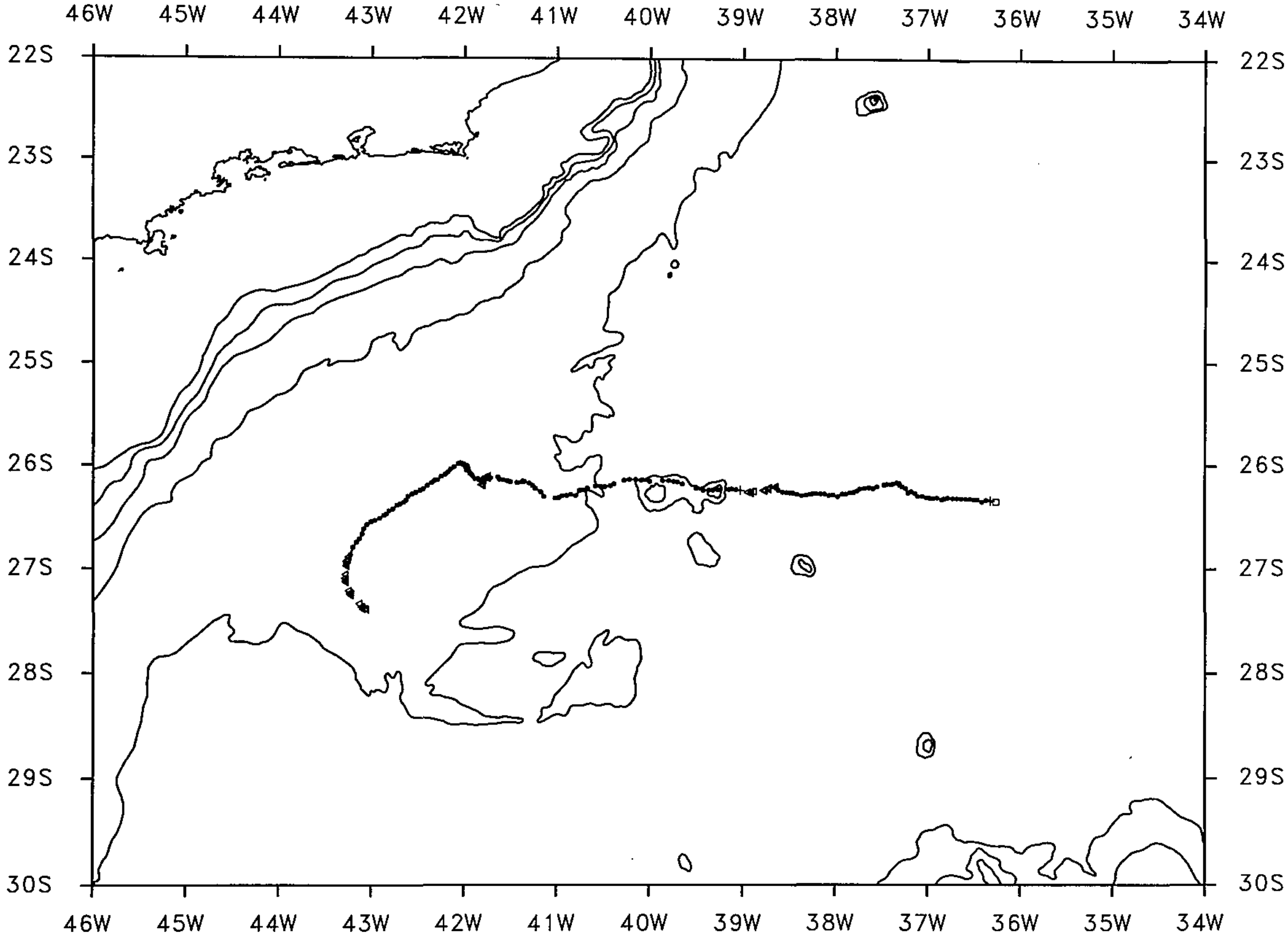
sampling interval= 24 h
number of samples= 165

average temperature= 4.92 degC

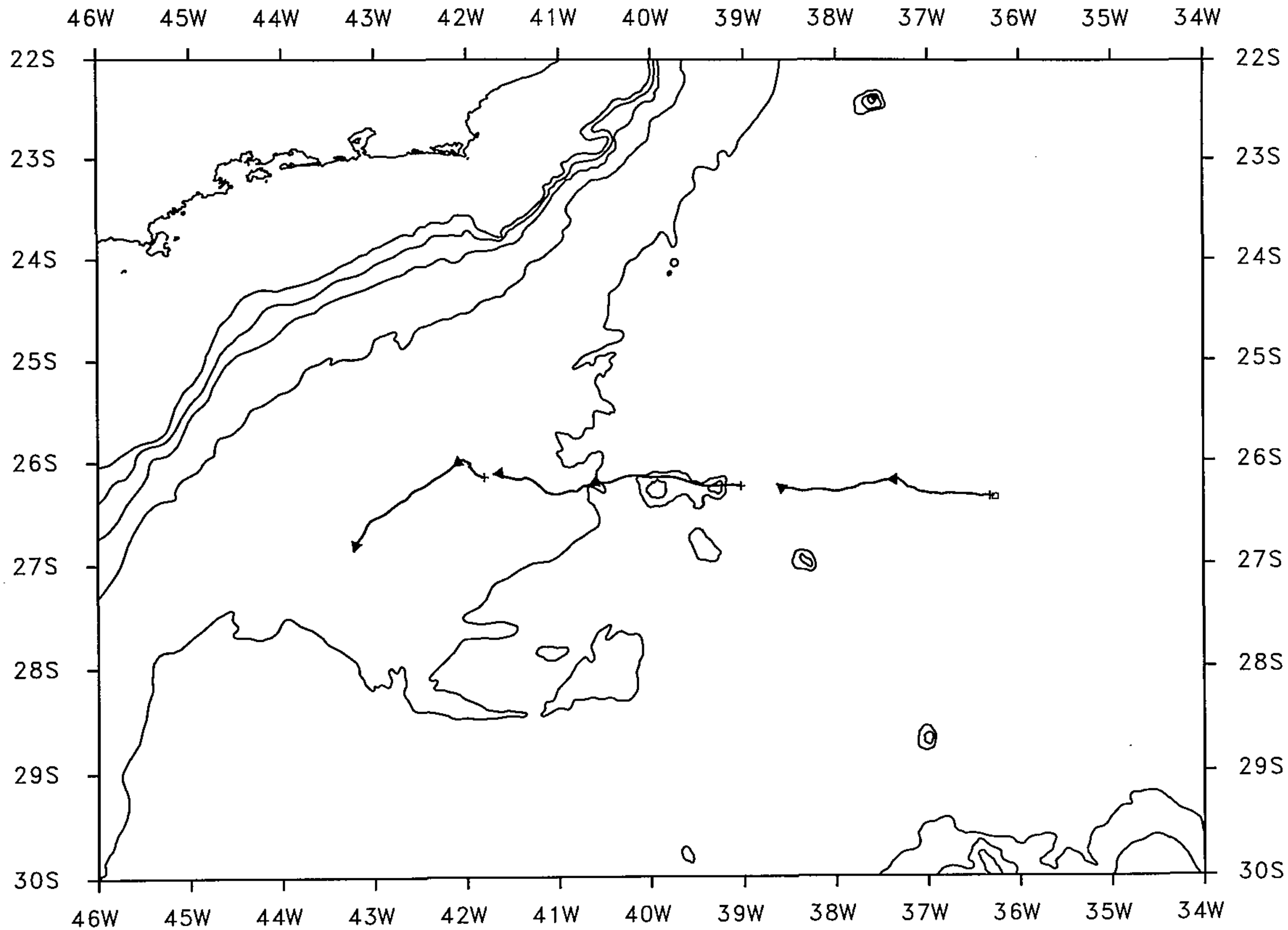
temperature variance= 0.0123 degC*degC

covar(u,temp)= 0.03 cm.degC/s
covar(v,temp)= -0.05 cm.degC/s

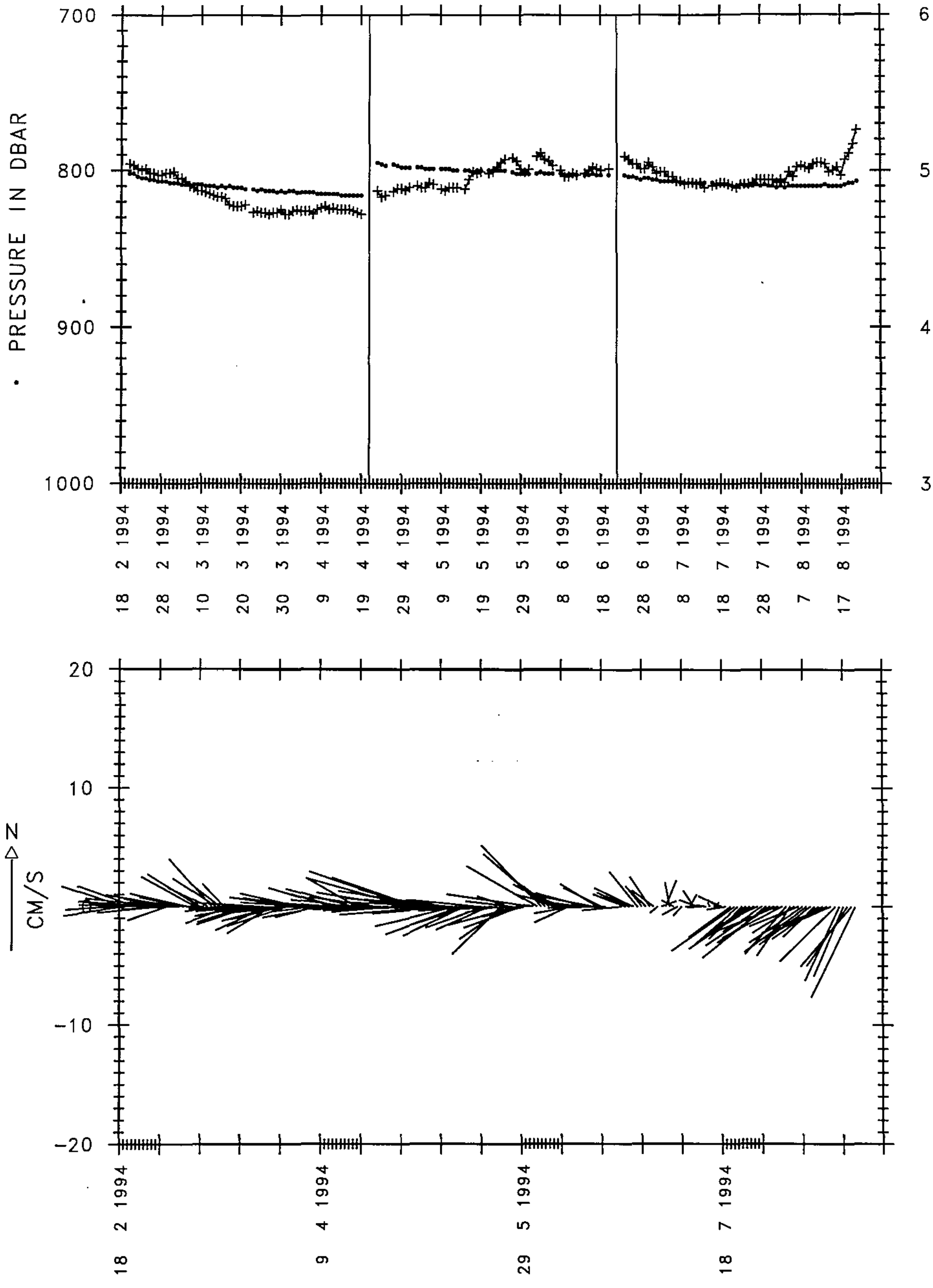
Comments:



SAMBA M102 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M102 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M102 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m102

launch date	launch lat	launch long
1994 2 18 2h UT	26.350 S	36.265 W

file	m102-c4.fin	m102-c5.fin	m102-c6.fin
date of 1st pos	1994 8 24 (16307)	1994 10 25 (16369)	1994 12 26 (16431)
1st pos	42.901W 27.451S	44.170W 26.007S	43.293W 24.598S
last pos	43.889W 25.920S	42.446W 24.948S	44.427W 25.203S
1st P and T	825dbar 5.04degC	807dbar 4.91degC	809dbar 4.46degC
last P and T	820dbar 4.69degC	848dbar 4.17degC	783dbar 5.27degC
displacements (East and North)	-98km 170km	173km 118km	-114km -67km
mean velocities (East and North)	-1.92cm/s 3.34cm/s	3.39cm/s 2.31cm/s	-2.24cm/s -1.32cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.26 cm/s [-3.83, 3.30]
average north velocity comp.= 1.42 cm/s [-1.26, 4.11]

variances
variance of east velocity comp.= 51.81 cm2/s2 [17.96, 85.67]
variance of north velocity comp.= 29.32 cm2/s2 [10.16, 48.48]

covariance
covariance= 17.24 cm2/s2 [-0.77, 35.24]

Eddy Kinetic Energy
EKE= 40.57 cm2/s2 [21.12, 60.02]

Temperature time series statistics:

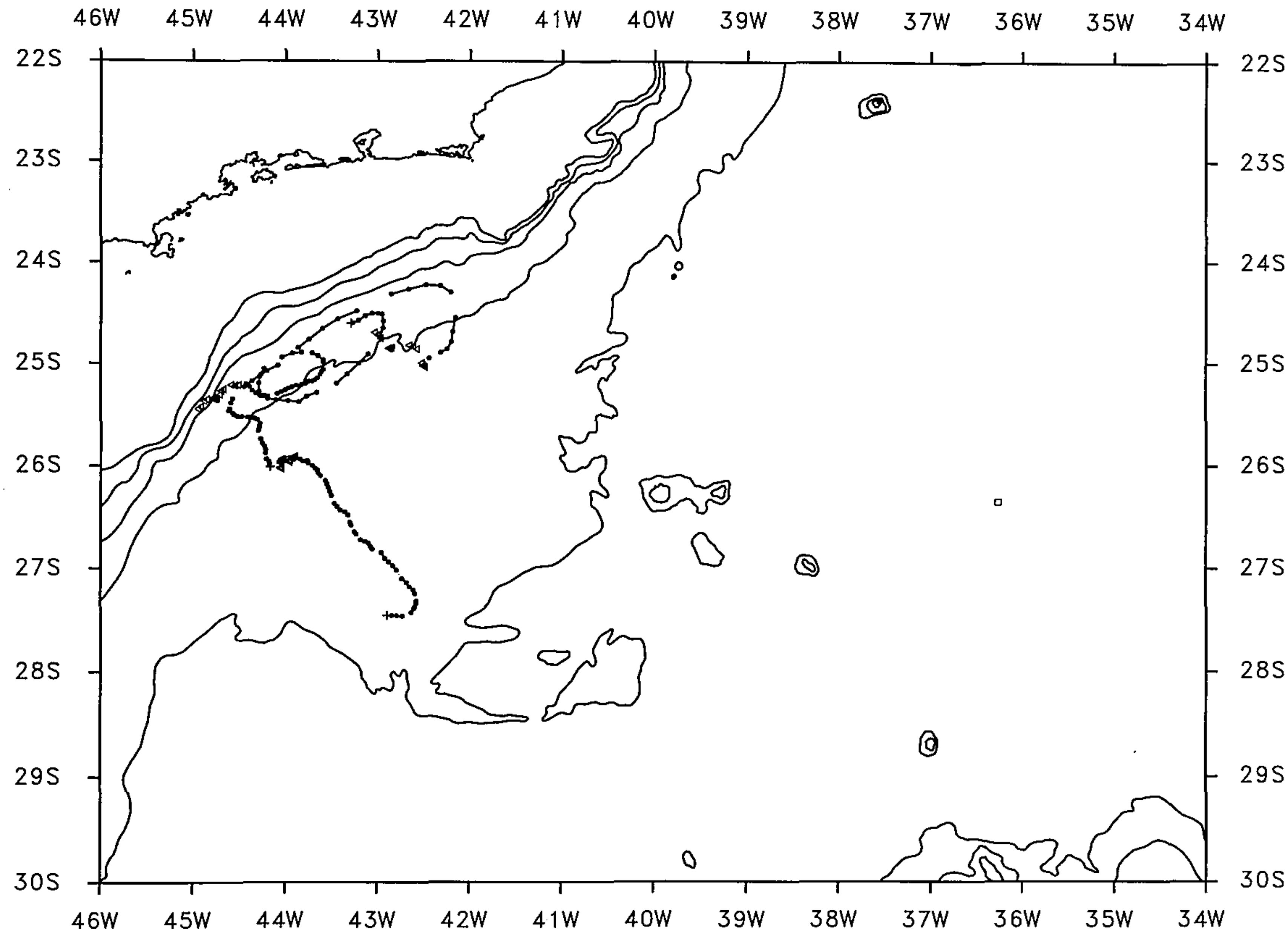
sampling interval= 24 h
number of samples= 153

average temperature= 4.63 degC

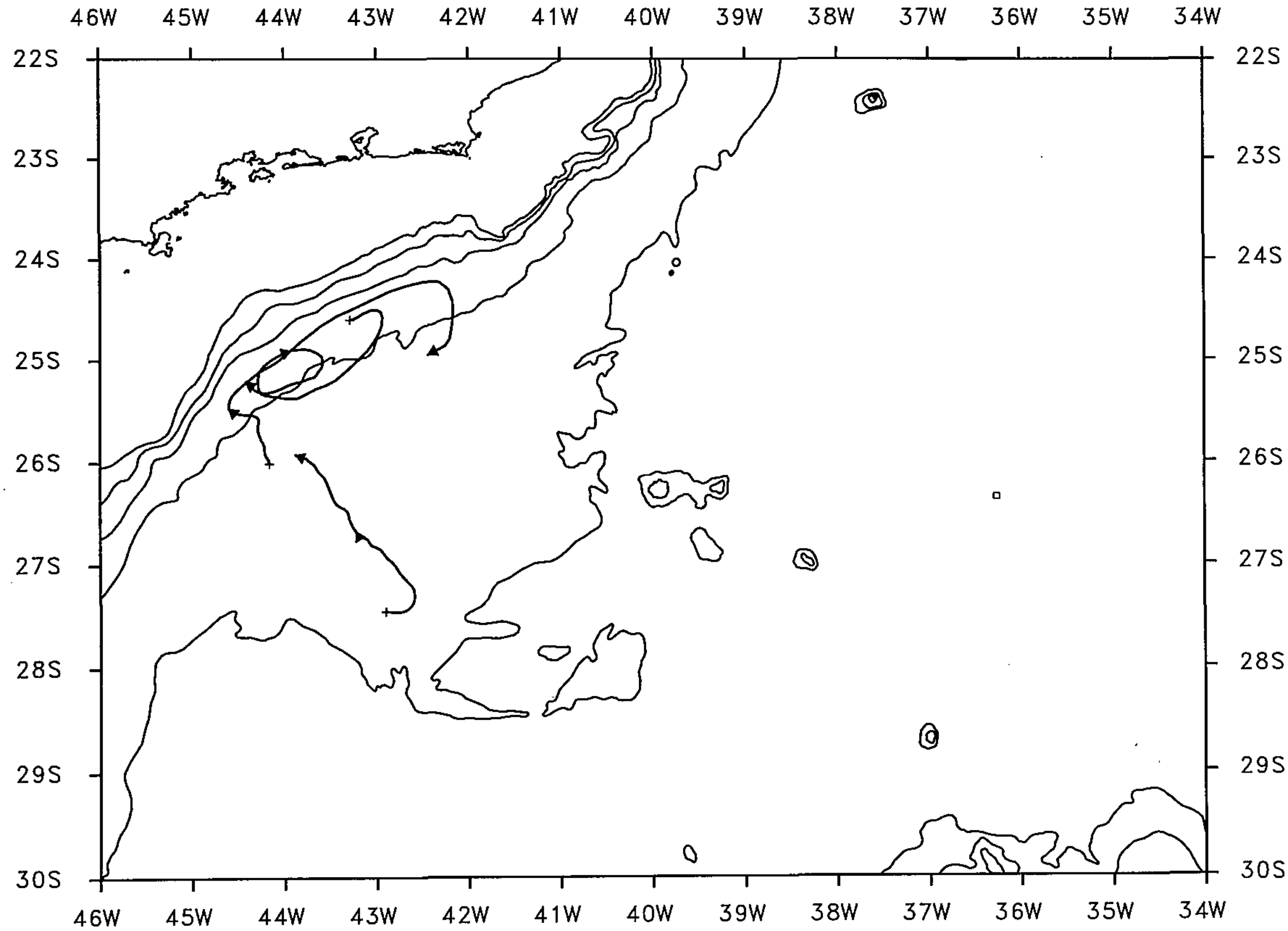
temperature variance= 0.0916 degC*degC

covar(u,temp)= -0.48 cm.degC/s
covar(v,temp)= 0.55 cm.degC/s

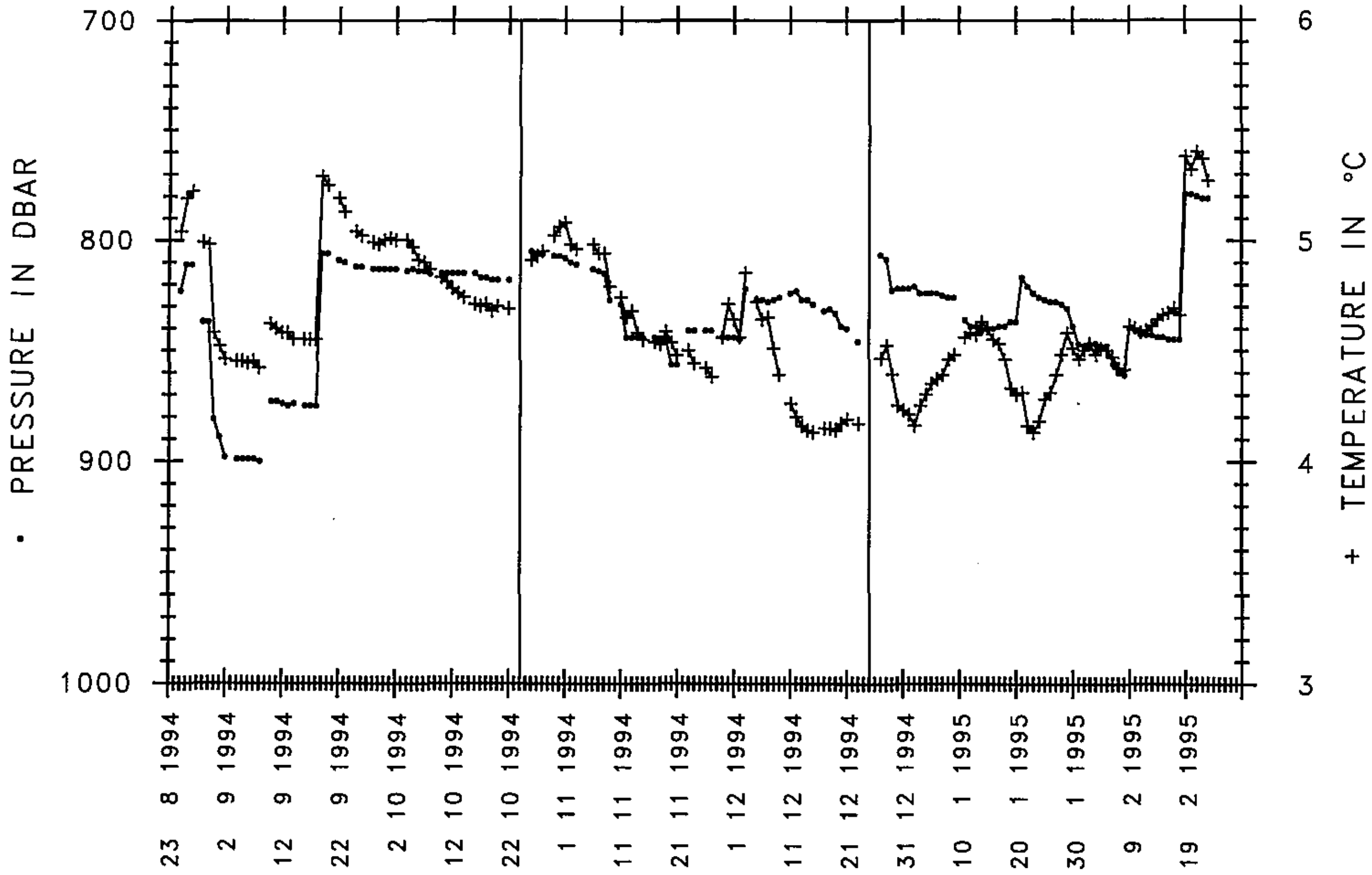
Comments:

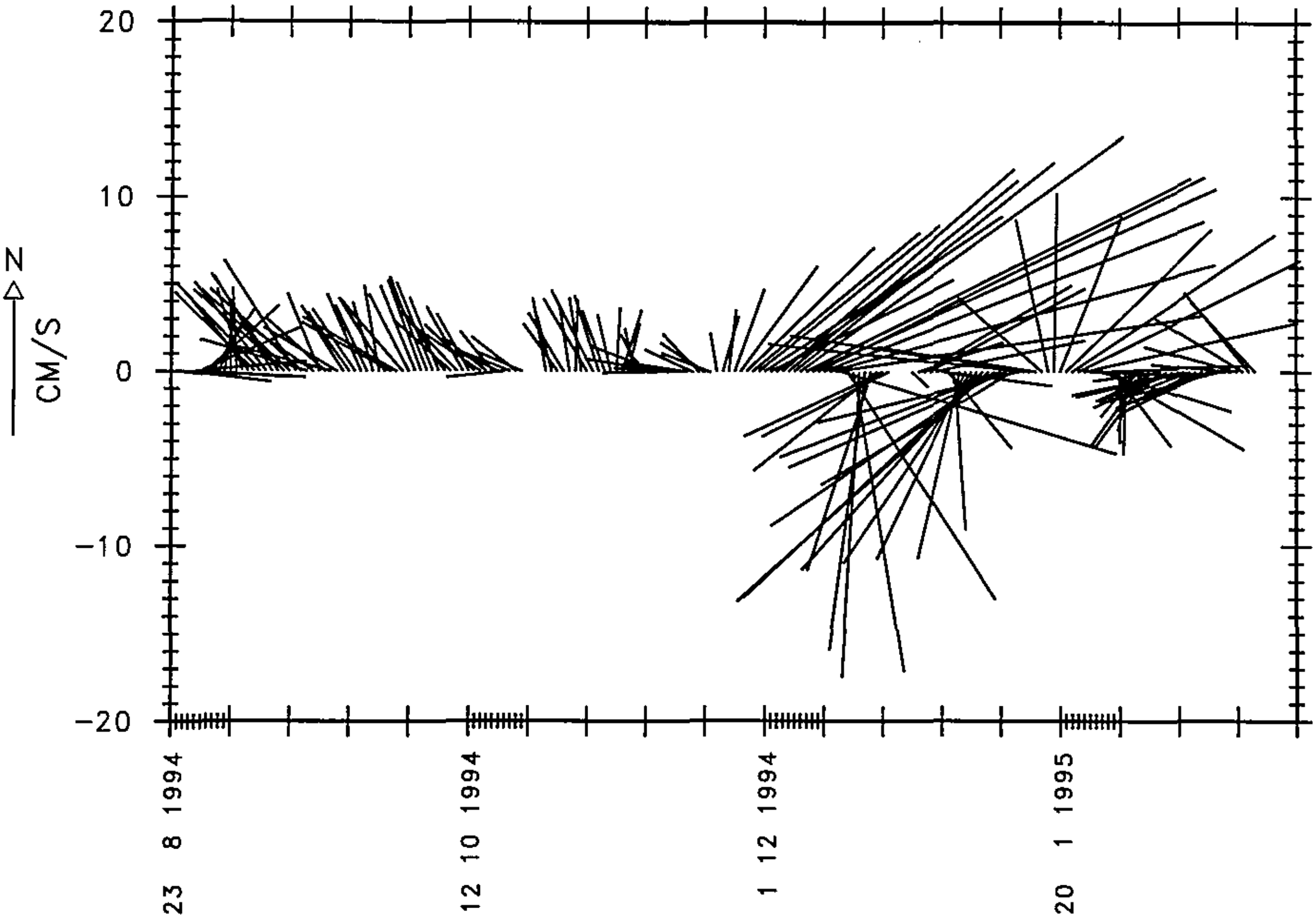


SAMBA M102 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M102 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED





SAMBA M102 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m102

launch date	launch lat	launch long
1994 2 18 2h UT	26.350 S	36.265 W

file	m102-c7.fin	m102-c8.fin	m102-c9.fin
date of 1st pos	1995 2 26 (16493)	1995 4 29 (16555)	1995 6 30 (16617)
1st pos	44.996W 25.633S	42.487W 24.301S	45.649W 27.006S
last pos	43.223W 24.504S	45.503W 26.917S	43.088W 24.236S
1st P and T	811dbar 4.34degC	772dbar 4.61degC	819dbar 4.85degC
last P and T	1467dbar 3.49degC	810dbar 5.08degC	851dbar 3.99degC
displacements (East and North)	178km 125km	-302km -291km	257km 308km
mean velocities (East and North)	3.50cm/s 2.46cm/s	-5.93cm/s -5.70cm/s	5.03cm/s 6.04cm/s
number of pos	36	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 110

11 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 2.55 cm/s [-7.14, 12.24]
average north velocity comp.= 2.55 cm/s [-6.67, 11.76]

variances
variance of east velocity comp.= 213.07 cm2/s2 [35.00, 391.14]
variance of north velocity comp.= 192.76 cm2/s2 [31.66, 353.86]

covariance
covariance= 53.68 cm2/s2 [-66.08, 173.44]

Eddy Kinetic Energy
EKE= 202.91 cm2/s2 [82.85, 322.98]

Temperature time series statistics:

sampling interval= 24 h
number of samples= 106

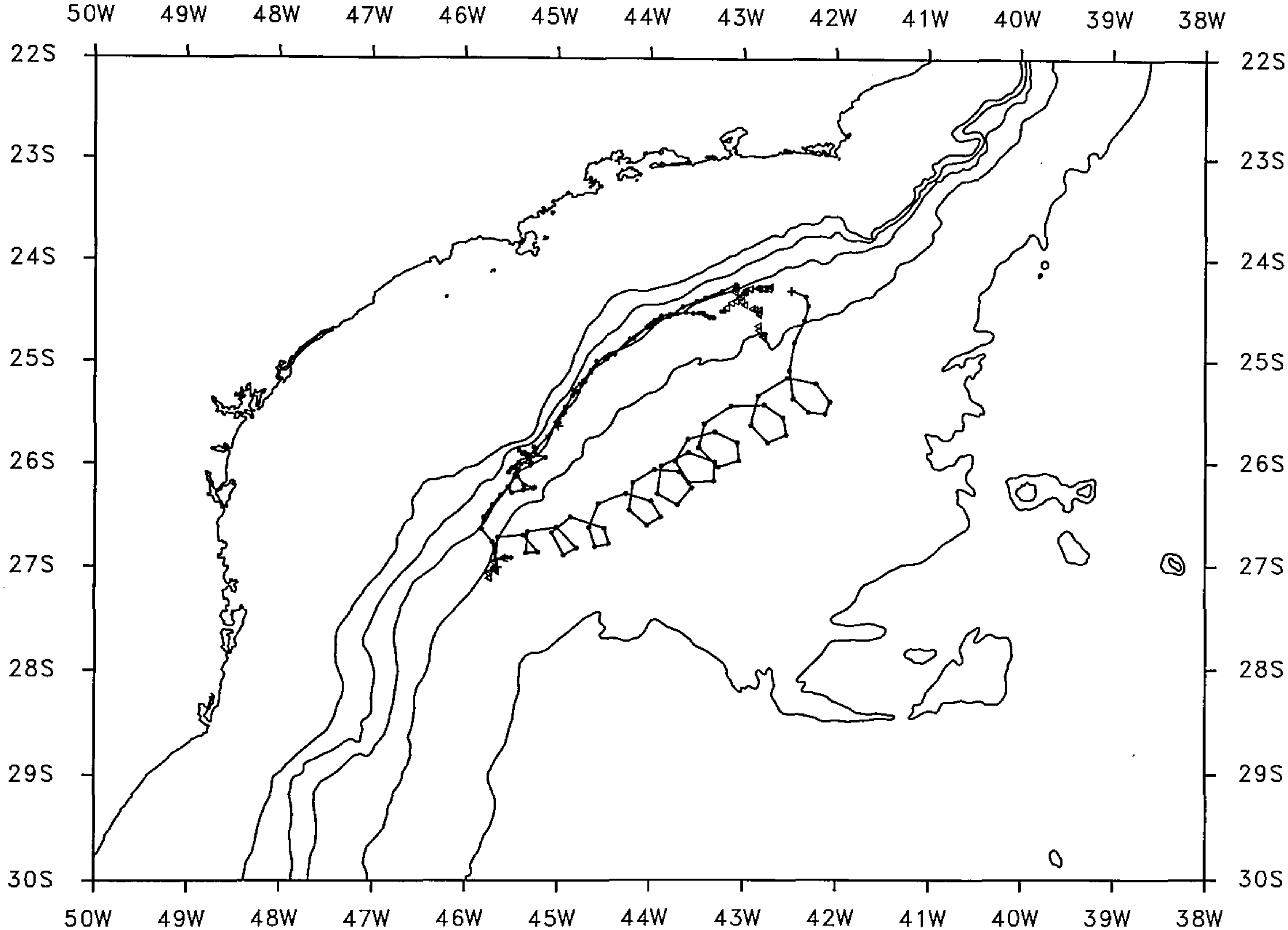
average temperature= 4.50 degC

temperature variance= 0.0669 degC*degC

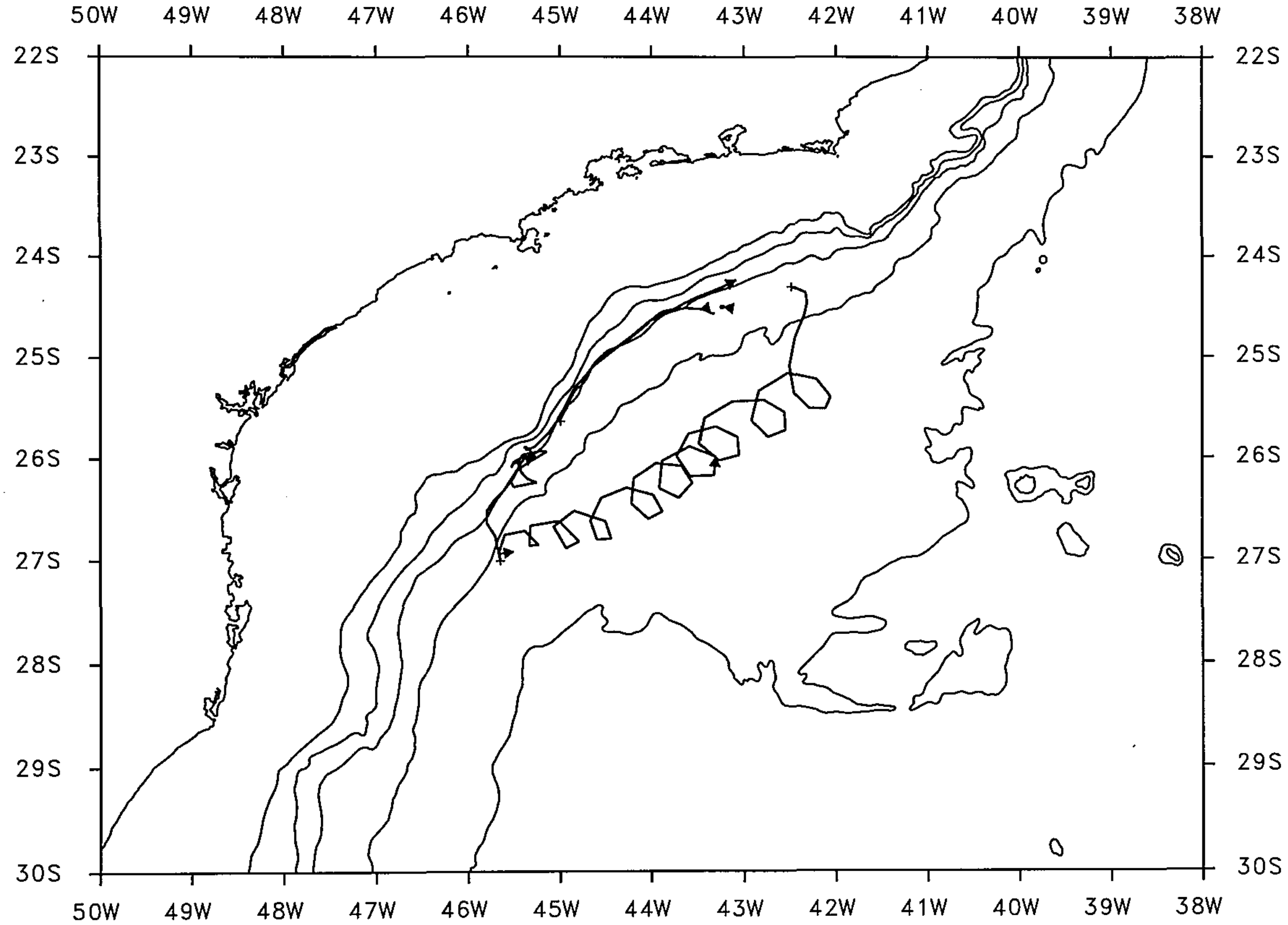
covar(u,temp)= -0.98 cm.degC/s
covar(v,temp)= -0.22 cm.degC/s

Comments:

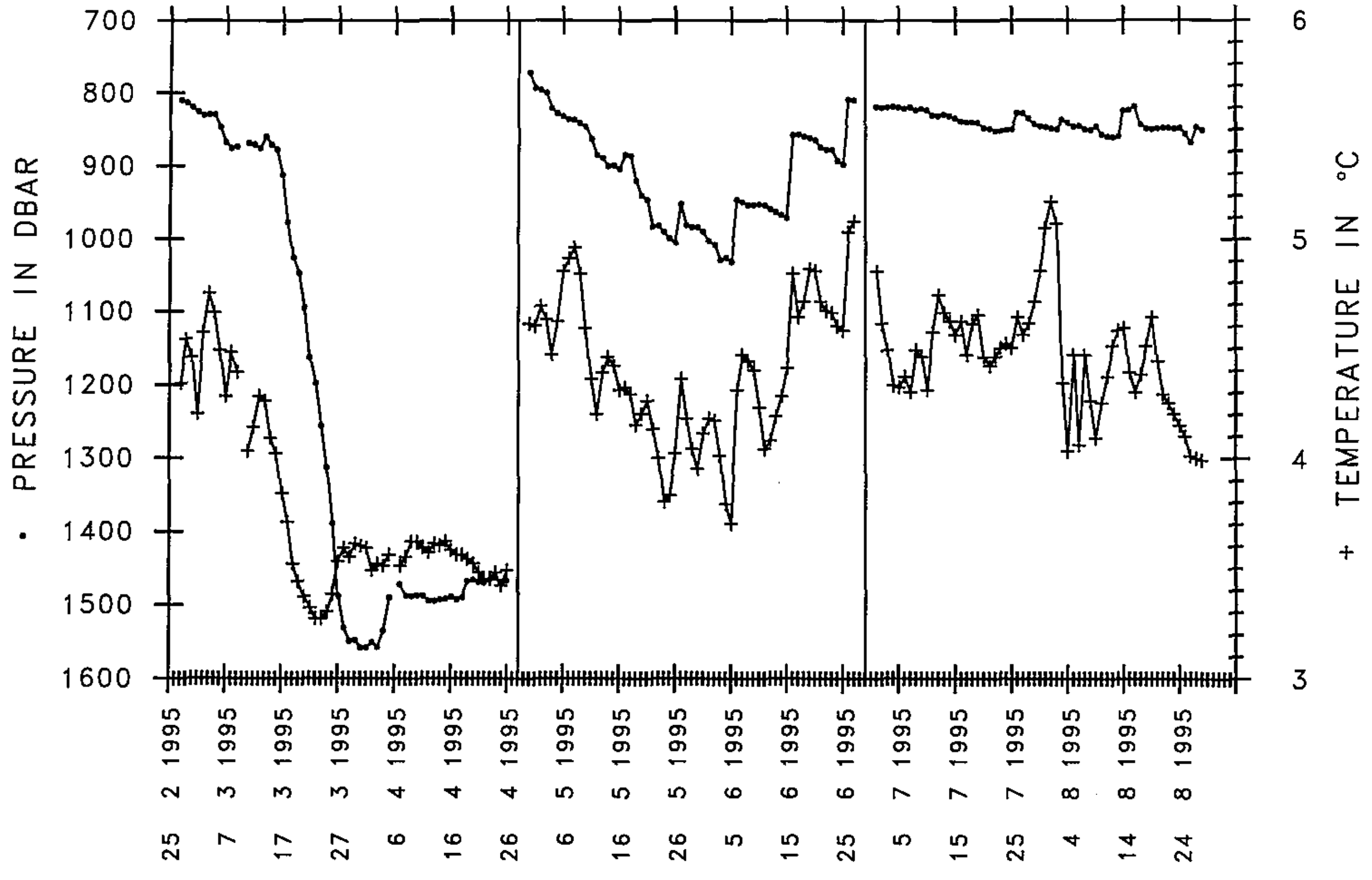
Velocity and temperature time series statistics are estimated from data within the [700,900] dbar interval.

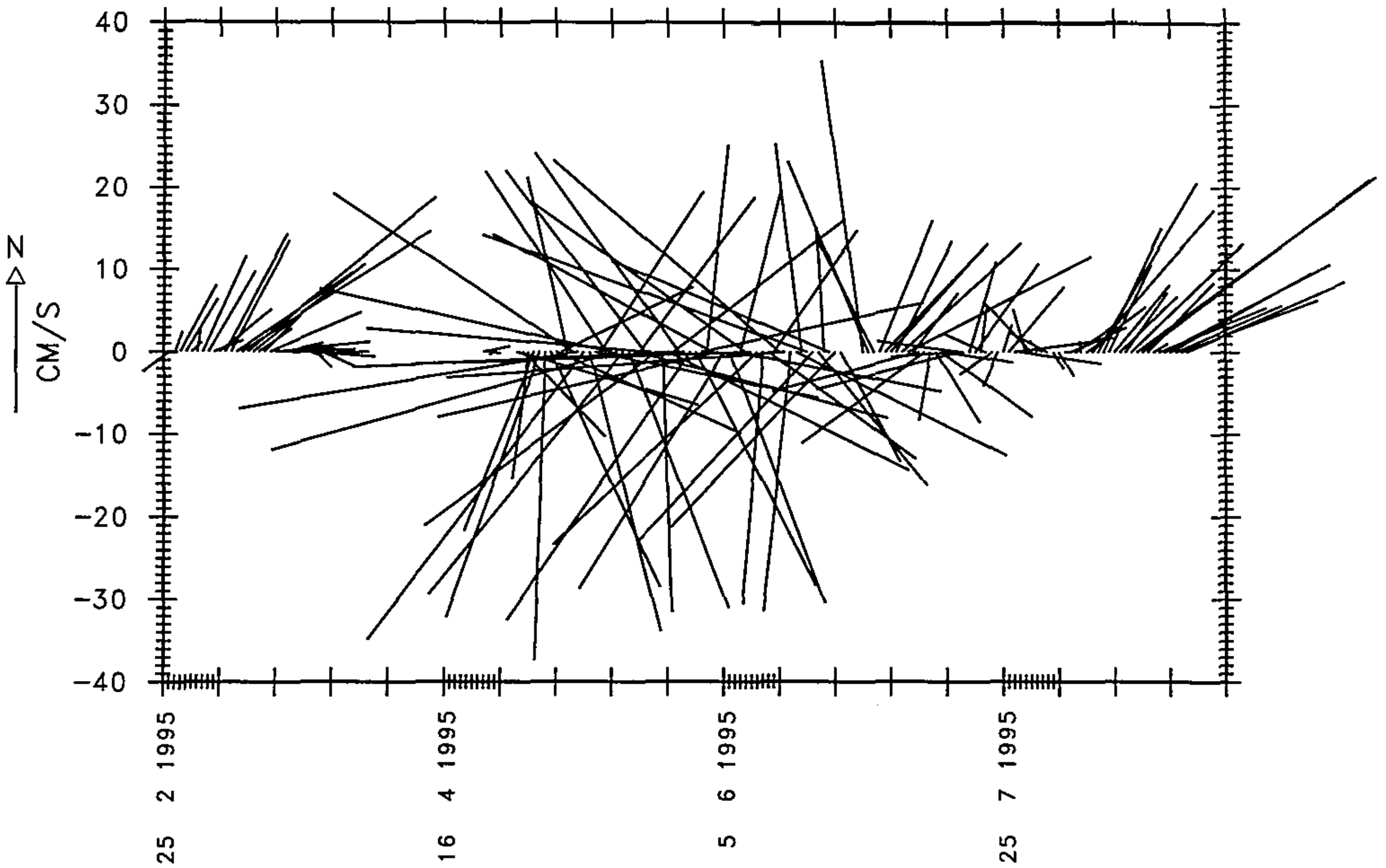


SAMBA M102 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M102 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M102 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #103

LAUNCHED AT: 26°29.7'S 36°05.2'W on 18/02/1994 06h58 UT

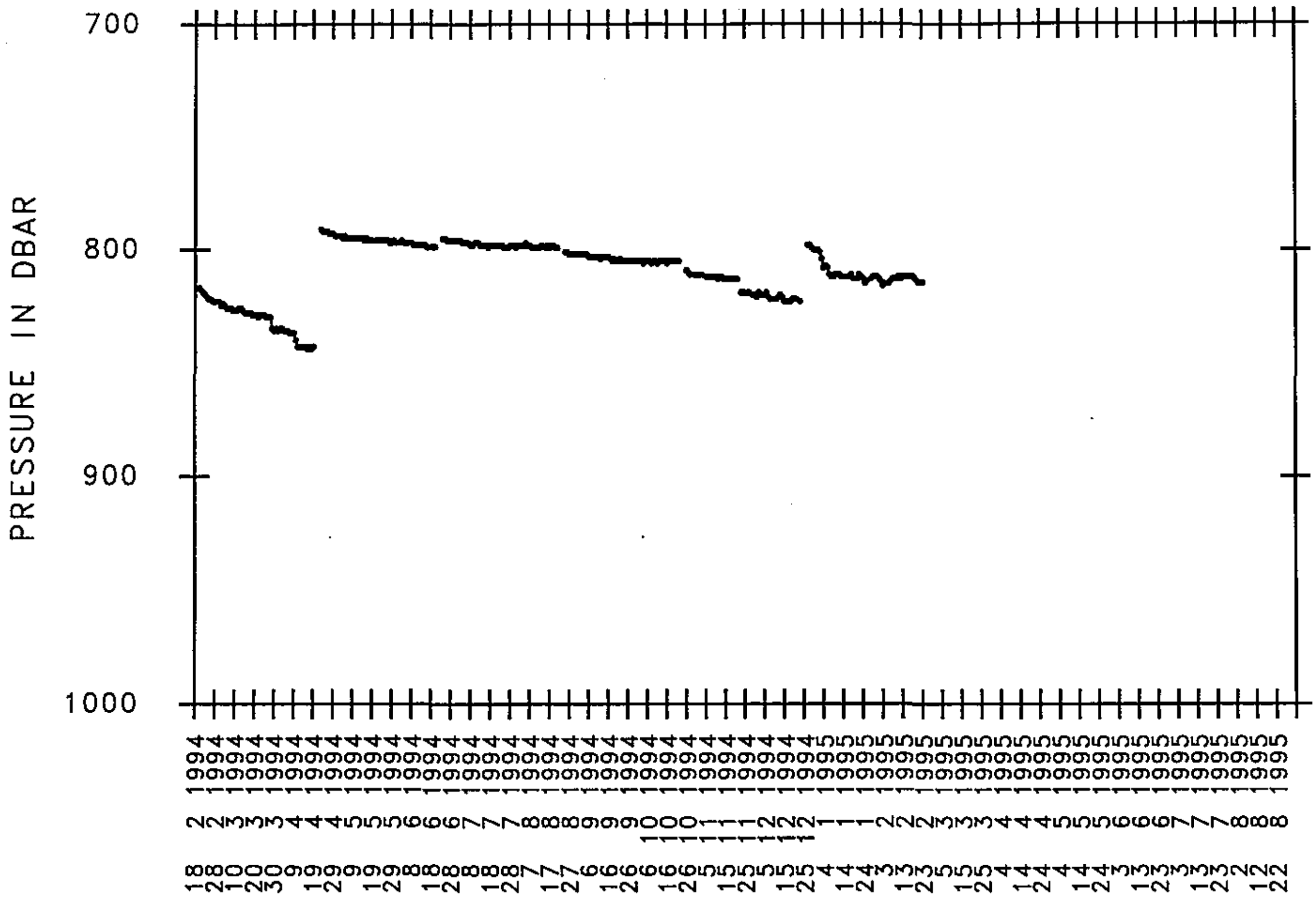
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

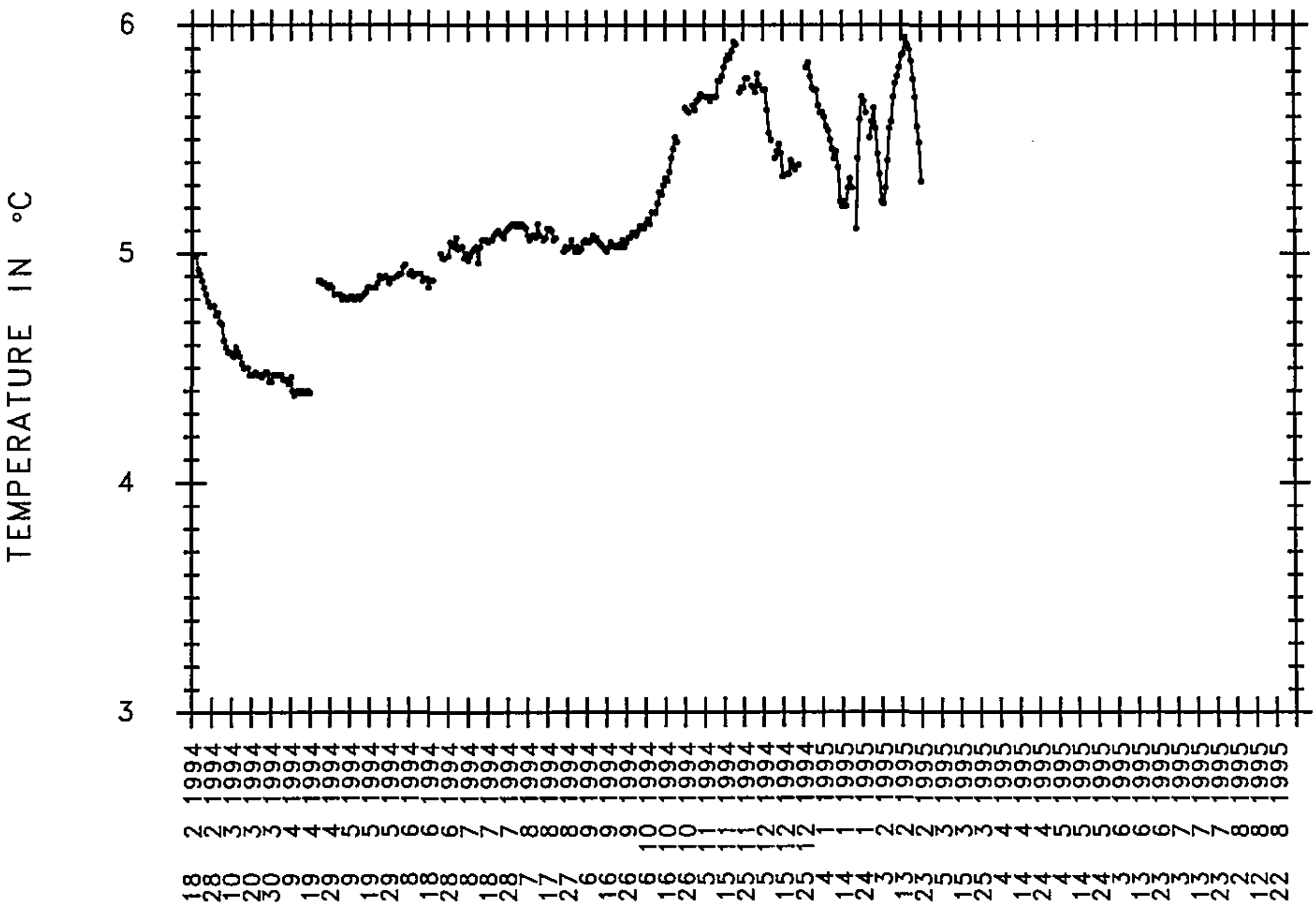
Comments

This float shows a general southwest flow over its 12 month life. When at surface at the end of its sixth cycle, the surface current advected it over a shallow bottom (< 770 dbar), over which it landed by diving at the beginning of cycle #7. With its actual software, this MARVOR is sticked there forever ! (the new software can manage that case however). Although the existence of an equatorward IWBC cannot be excluded near 30°S, this float (and float #104) trajectories, do not show any.

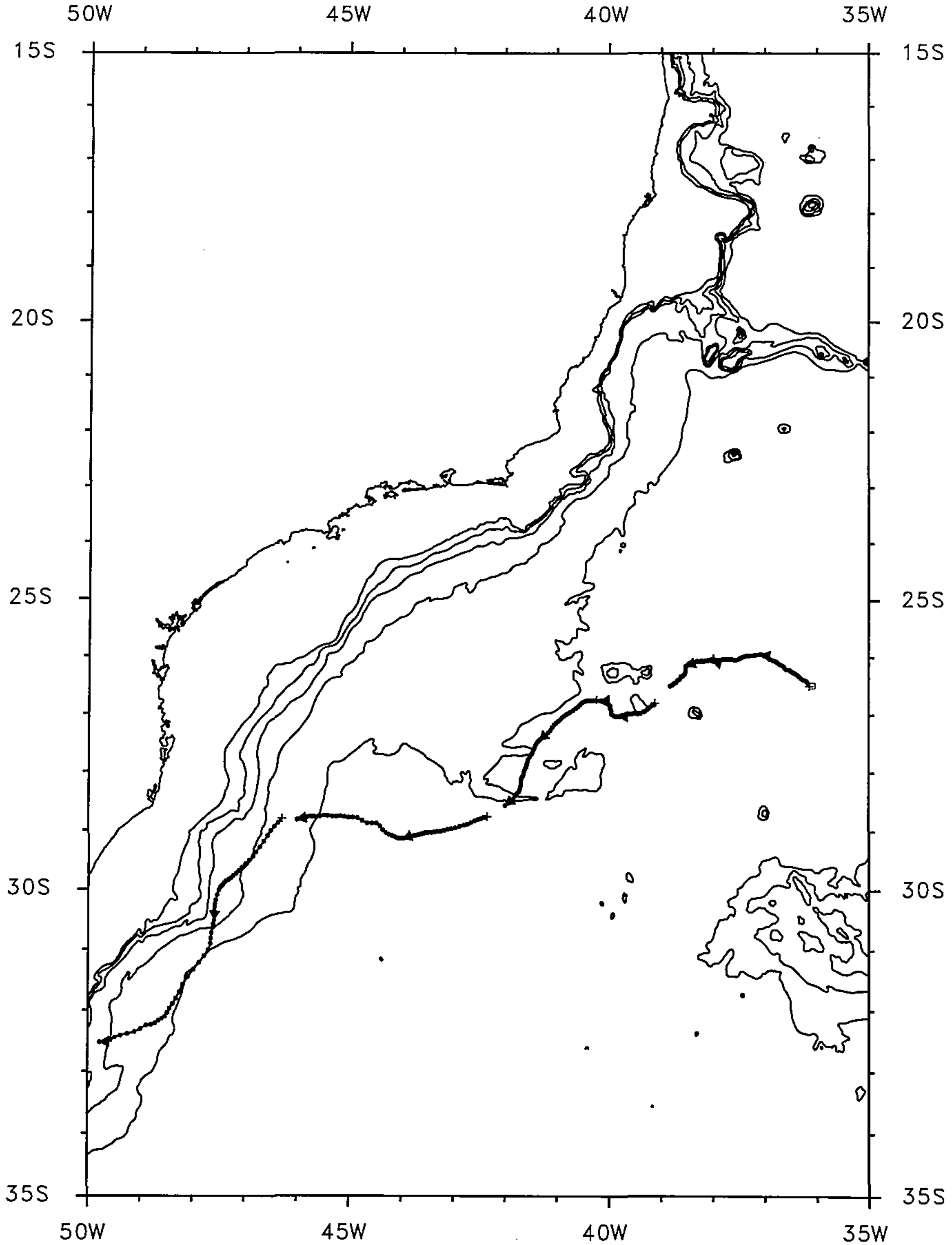
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m103-c1.raw	m103-c1.fin	m103-c1.diaric
m103-c2.raw	m103-c2.fin	m103-c2.diaric
m103-c3.raw	m103-c3.fin	m103-c3.diaric
m103-c4.raw	m103-c4.fin	m103-c4.diaric
m103-c5.raw	m103-c5.fin	m103-c5.diaric
m103-c6.raw	m103-c6.fin	m103-c6.diaric





SAMBA M103 CYCLES 1 TO 6



SAMBA M103 (FEBRUARY 1994 - FEBRUARY 1995)

EXPERIMENT: SAMBA

FLOAT: m103

launch date	launch lat	launch long
1994 2 18 7h UT	26.495 S	36.087 W

file	m103-c1.fin	m103-c2.fin	m103-c3.fin
date of 1st pos	1994 2 19 (16121)	1994 4 22 (16183)	1994 6 23 (16245)
1st pos	36.141W 26.501S	37.994W 26.018S	39.125W 26.803S
last pos	38.017W 26.068S	38.828W 26.508S	40.175W 26.758S
1st P and T	817dbar 4.99degC	791dbar 4.88degC	795dbar 5.00degC
last P and T	843dbar 4.39degC	799dbar 4.88degC	799dbar 5.07degC
displacements (East and North)	-187km 48km	-83km -54km	-104km 5km
mean velocities (East and North)	-3.67cm/s 0.94cm/s	-1.72cm/s -1.13cm/s	-2.04cm/s 0.10cm/s
number of pos	60	57	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 177

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -2.48 cm/s [-3.20, -1.75]
average north velocity comp.= 0.00 cm/s [-0.86, 0.85]

variances
variance of east velocity comp.= 2.14 cm2/s2 [0.74, 3.53]
variance of north velocity comp.= 3.00 cm2/s2 [1.04, 4.97]

covariance
covariance= -0.37 cm2/s2 [-1.54, 0.80]

Eddy Kinetic Energy
EKE= 2.57 cm2/s2 [1.37, 3.77]

Temperature time series statistics:

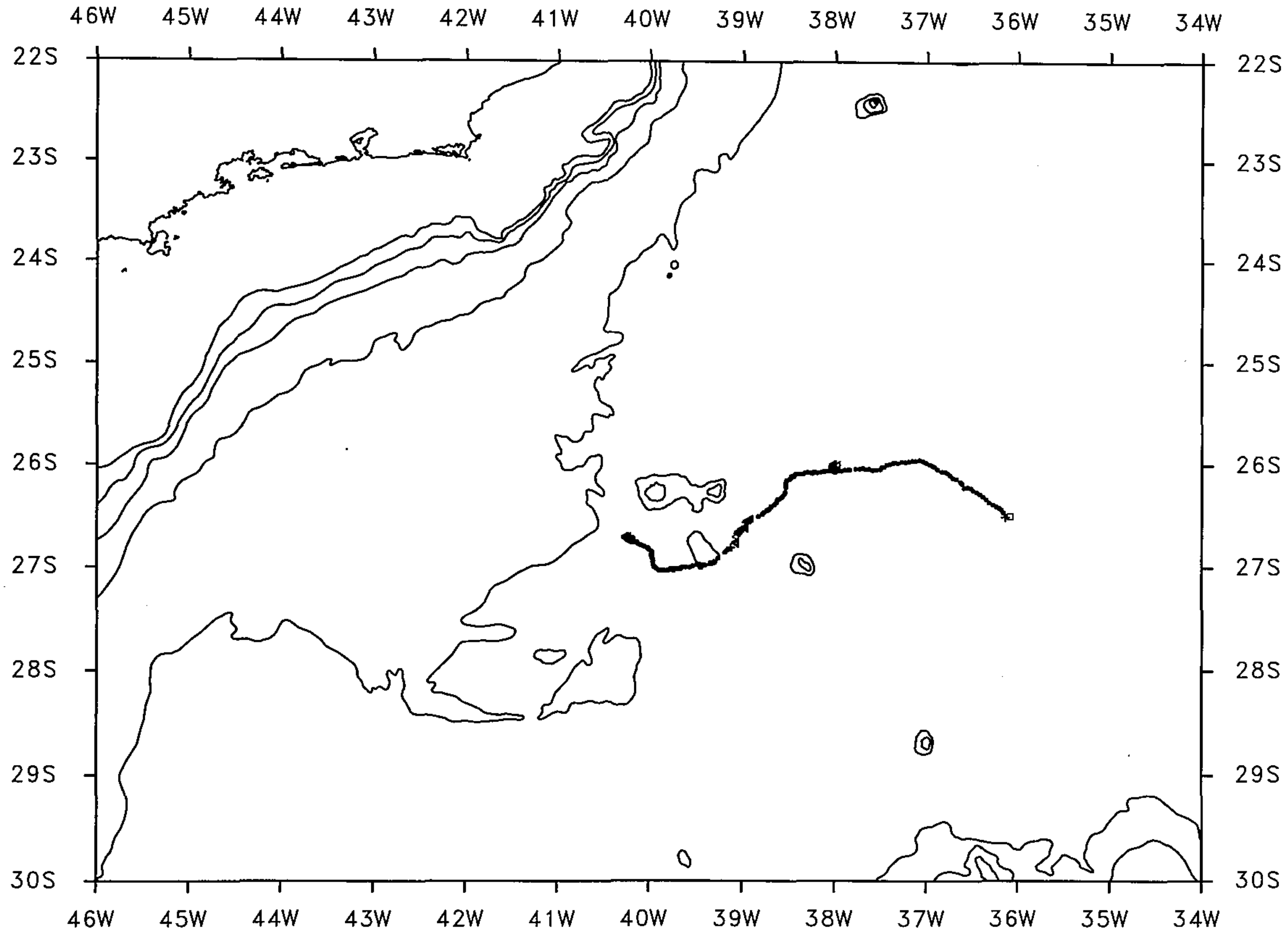
sampling interval= 24 h
number of samples= 166

average temperature= 4.82 degC

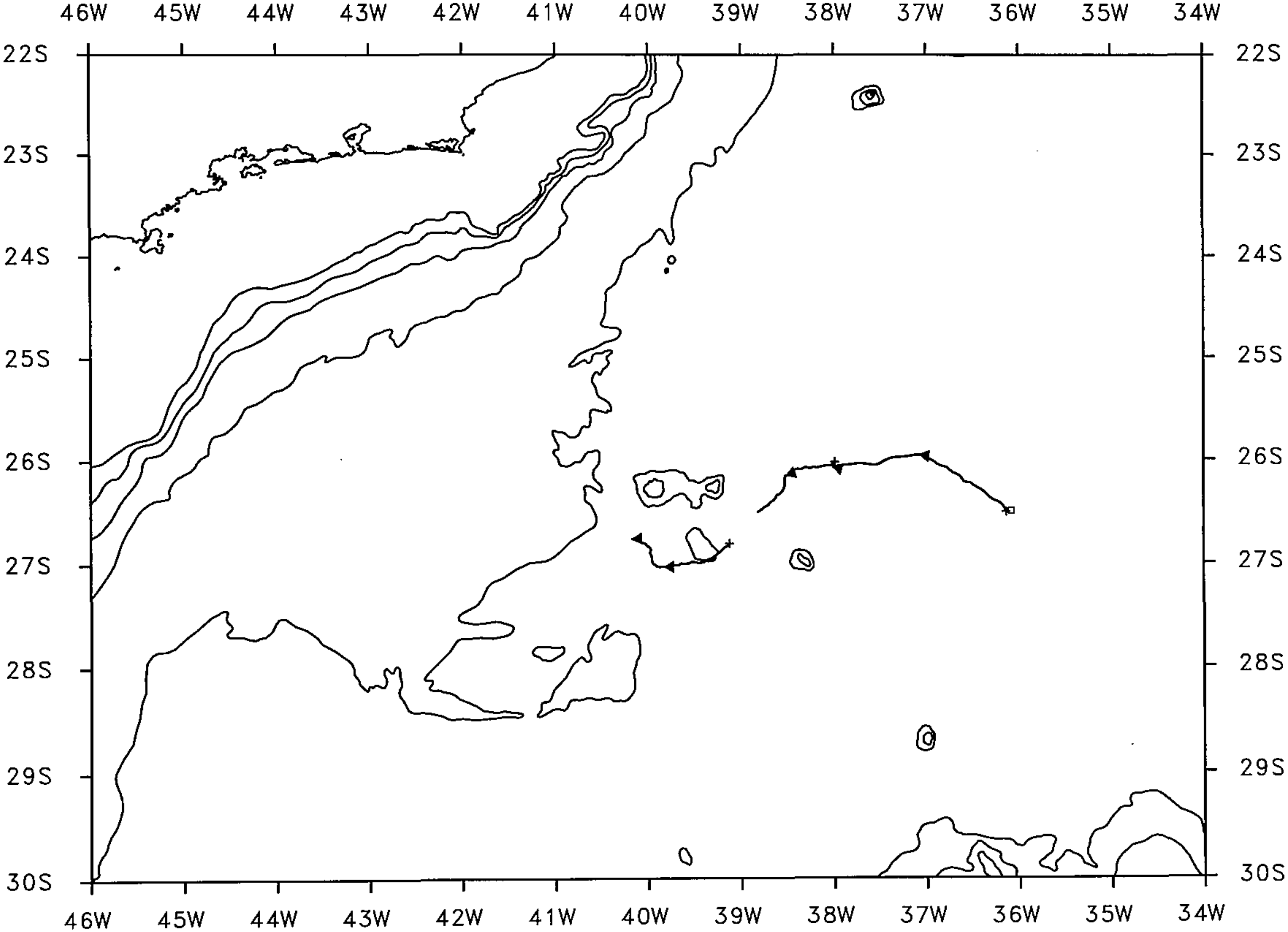
temperature variance= 0.0566 degC*degC

covar(u,temp)= 0.18 cm.degC/s
covar(v,temp)= -0.01 cm.degC/s

Comments:

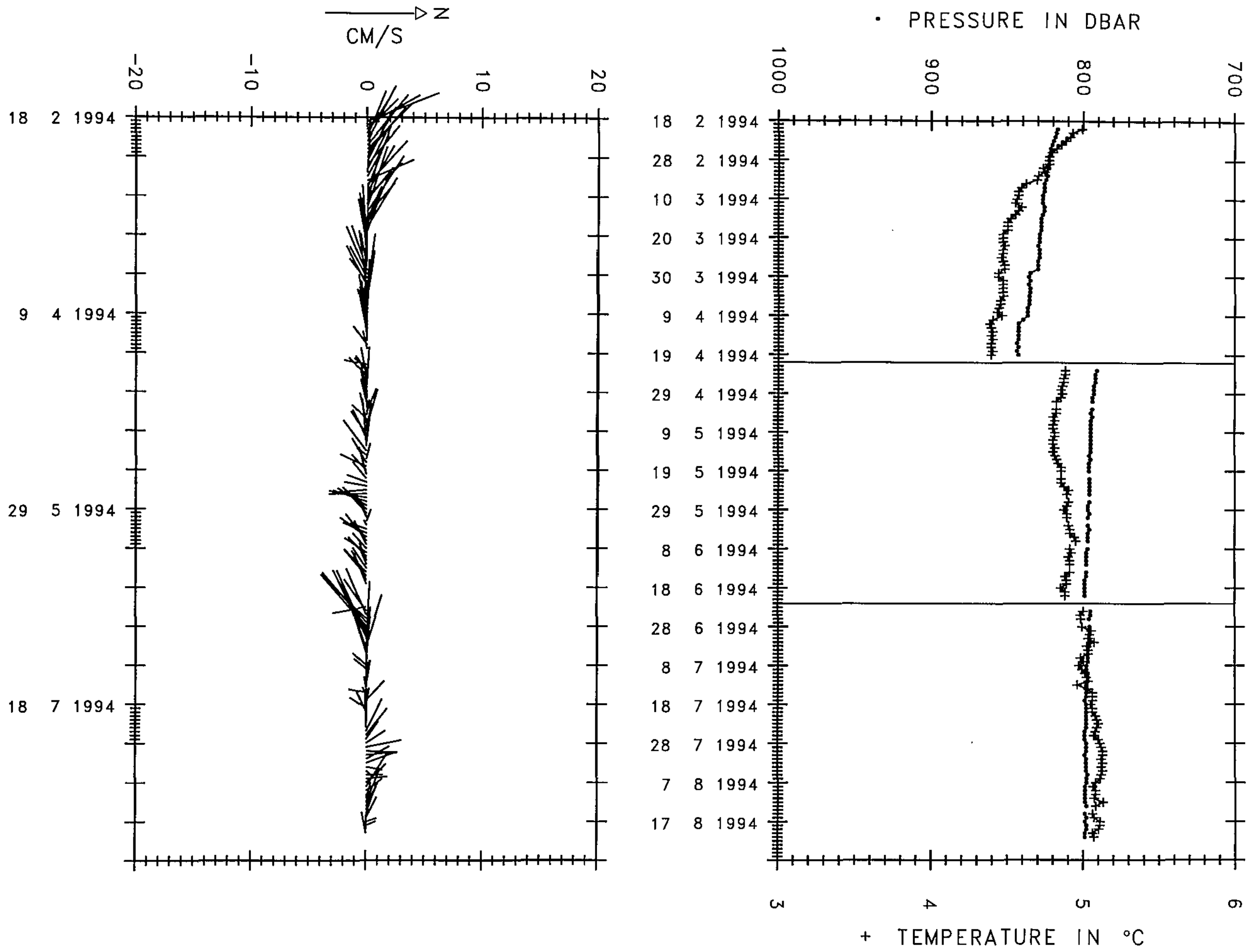


SAMBA M103 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M103 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED

SAMBA M103 CYCLES 1,2 AND 3



EXPERIMENT: SAMBA

FLOAT: m103
----

launch date	launch lat	launch long
1994 2 18 7h UT	26.495 S	36.087 W

file	m103-c4.fin	m103-c5.fin	m103-c6.fin
date of 1st pos	1994 8 24 (16307)	1994 10 25 (16369)	1994 12 26 (16431)
1st pos	40.234W 26.740S	42.343W 28.756S	46.284W 28.797S
last pos	41.997W 28.569S	45.996W 28.817S	49.770W 32.525S
1st P and T	801dbar 5.01degC	809dbar 5.64degC	798dbar 5.82degC
last P and T	805dbar 5.49degC	823dbar 5.39degC	815dbar 5.32degC
displacements (East and North)	-174km -203km	-356km -7km	-333km -414km
mean velocities (East and North)	-3.40cm/s -3.99cm/s	-6.98cm/s -0.13cm/s	-6.54cm/s -8.13cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -5.65 cm/s [-7.16, -4.15]
average north velocity comp.= -4.07 cm/s [-6.21, -1.92]

variances
variance of east velocity comp.= 9.26 cm2/s2 [3.21, 15.31]
variance of north velocity comp.= 18.80 cm2/s2 [6.52, 31.07]

covariance
covariance= -0.95 cm2/s2 [-7.04, 5.15]

Eddy Kinetic Energy
EKE= 14.03 cm2/s2 [7.18, 20.87]

Temperature time series statistics:
----

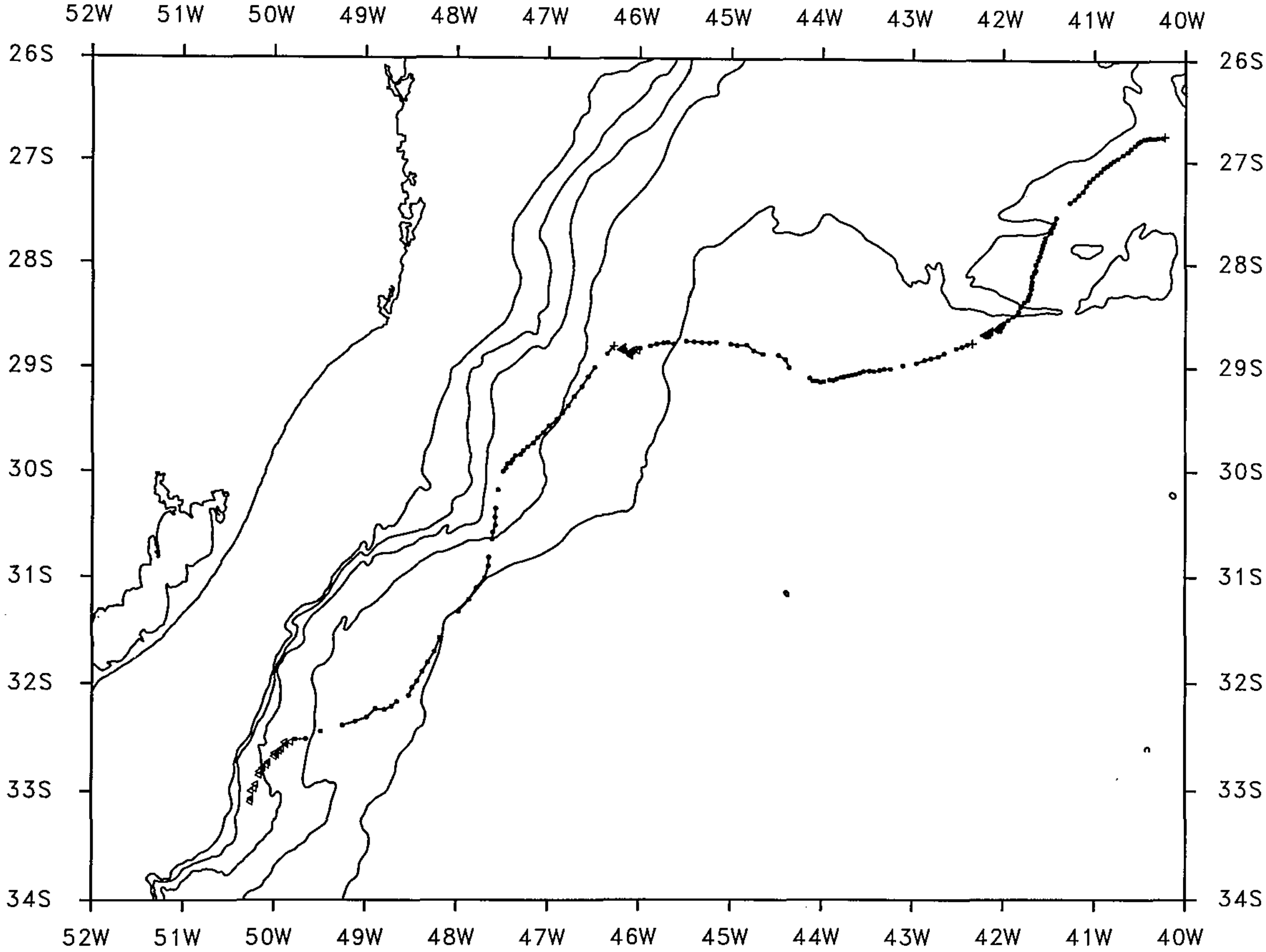
sampling interval= 24 h
number of samples= 167

average temperature= 5.43 degC

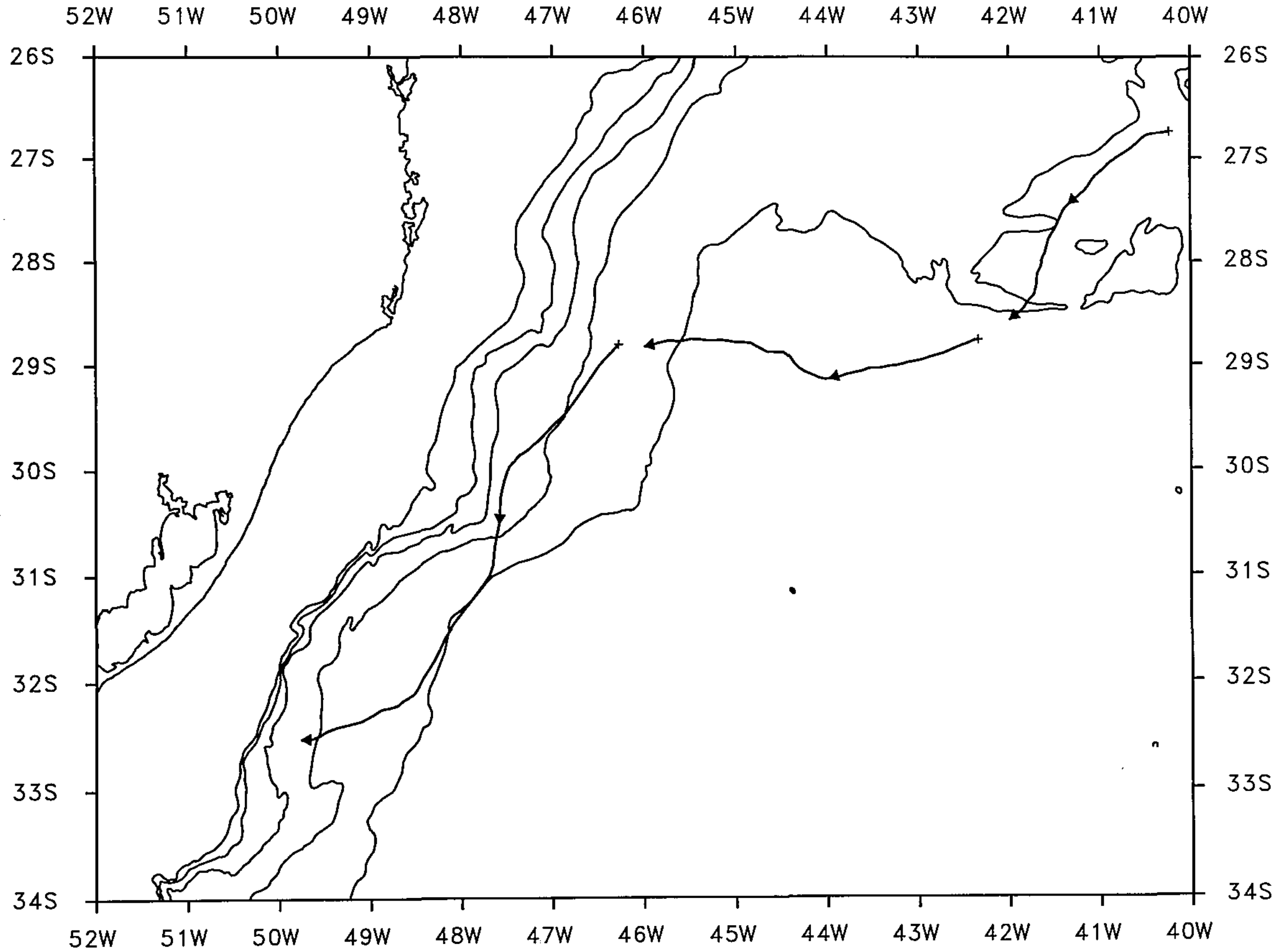
temperature variance= 0.0851 degC*degC

covar(u,temp)= -0.44 cm.degC/s
covar(v,temp)= 0.13 cm.degC/s

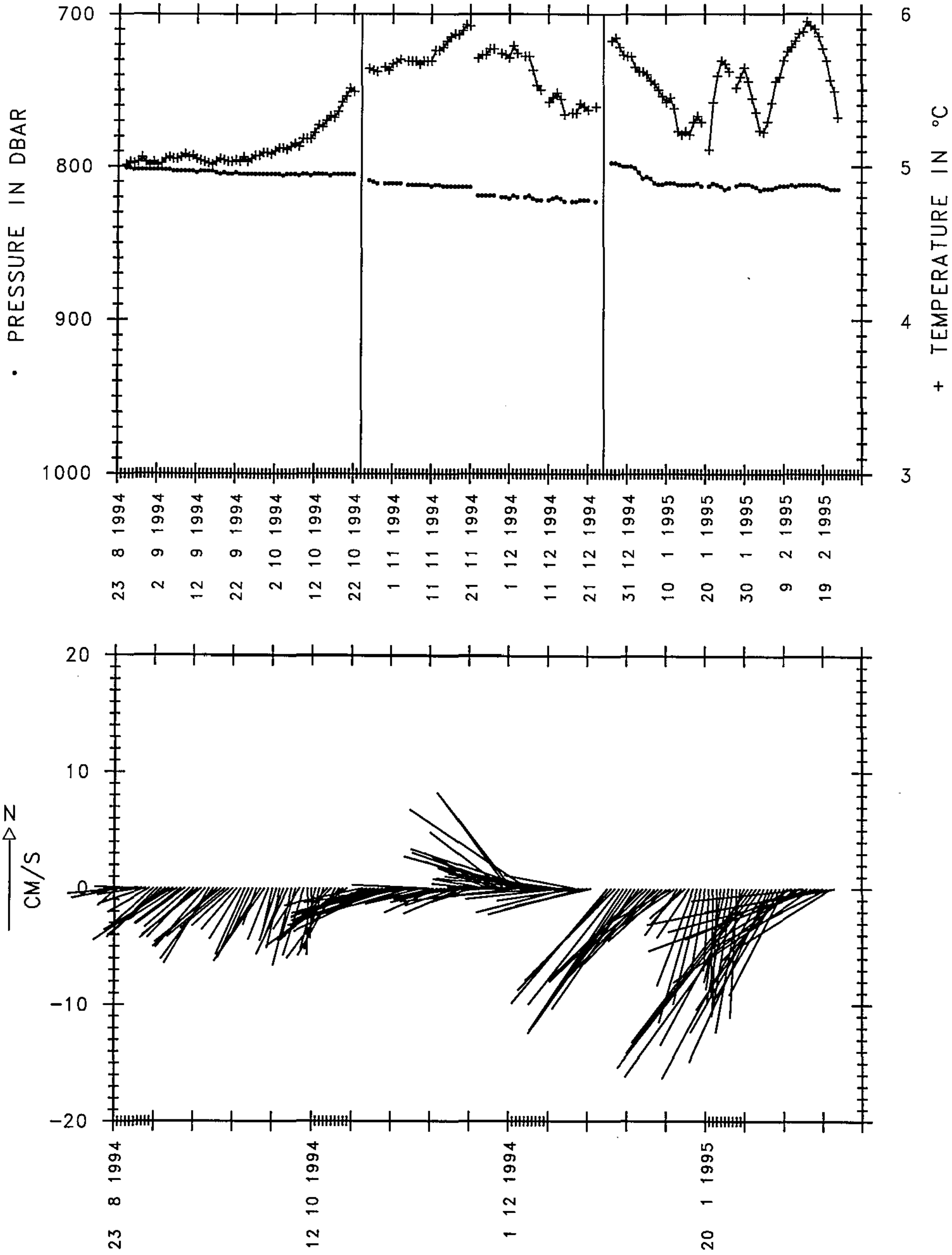
Comments:



SAMBA M103 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M103 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M103 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA
FLOAT: MARVOR #104

LAUNCHED AT: 26°39.1'S 35°54.2'W on 18/02/1994 08h58 UT

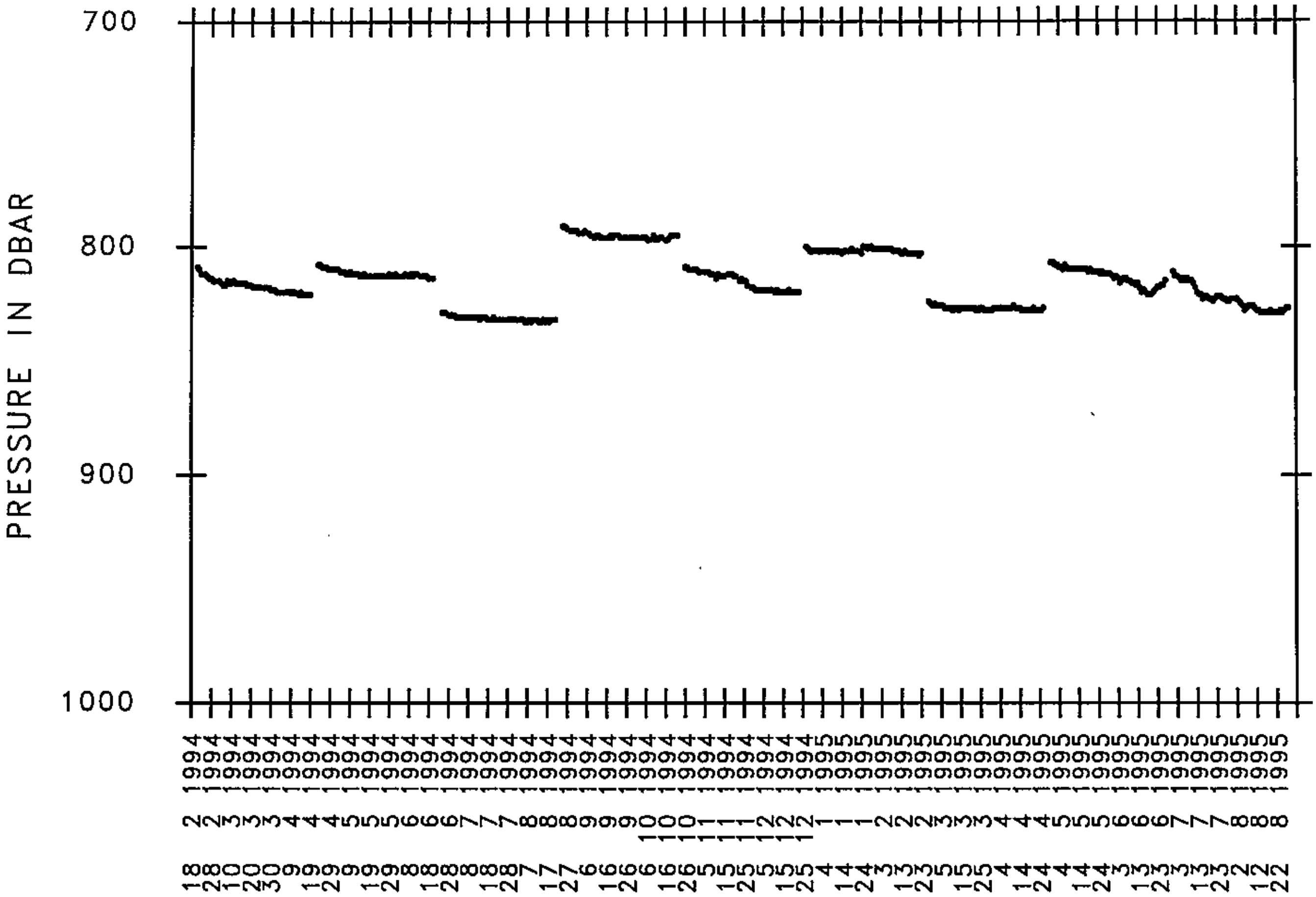
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

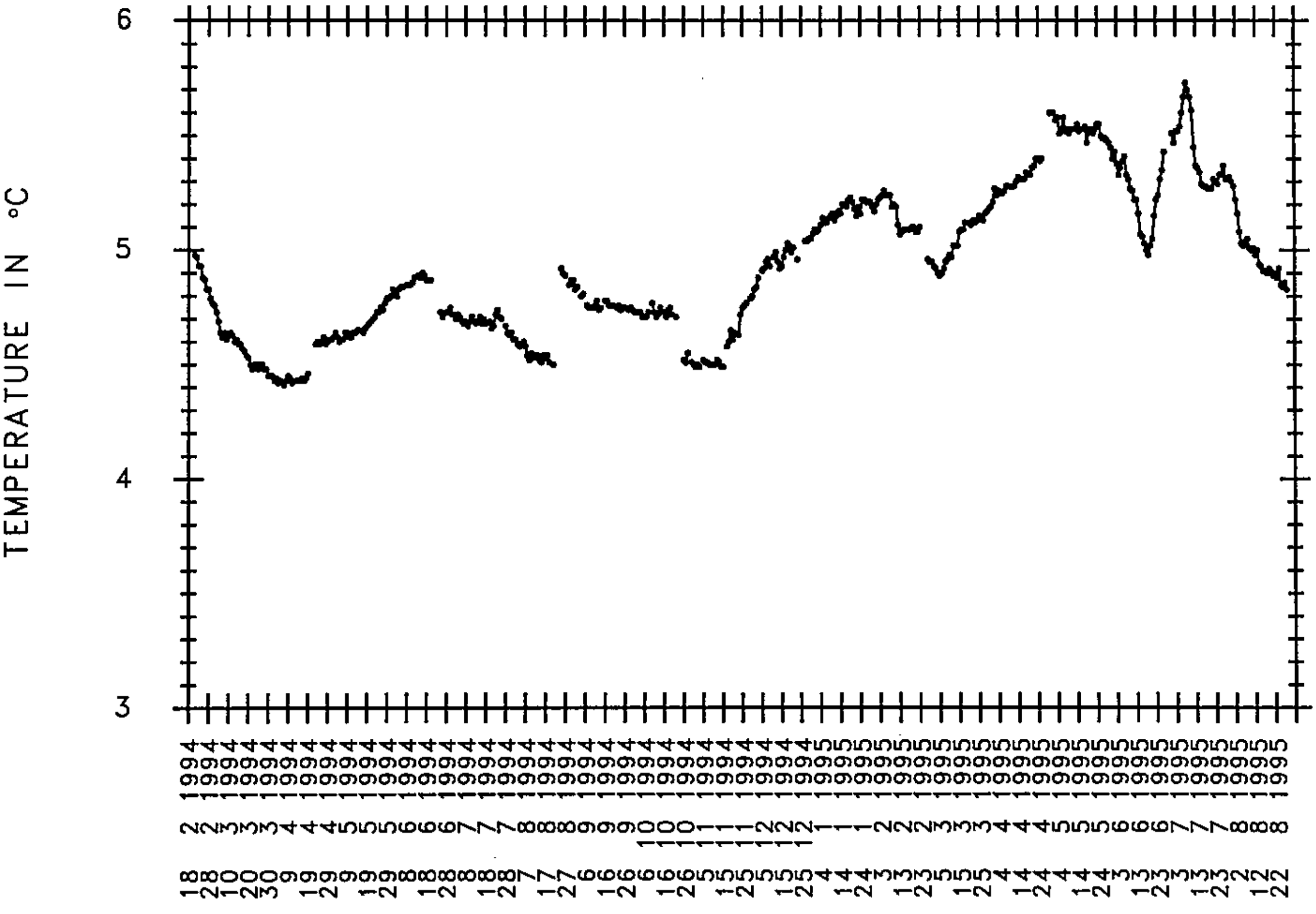
Comments

Similarly with MARVOR #103, this float shows a general southwest flow, over its 18 months life. It should probably reach later the confluence region to the south.

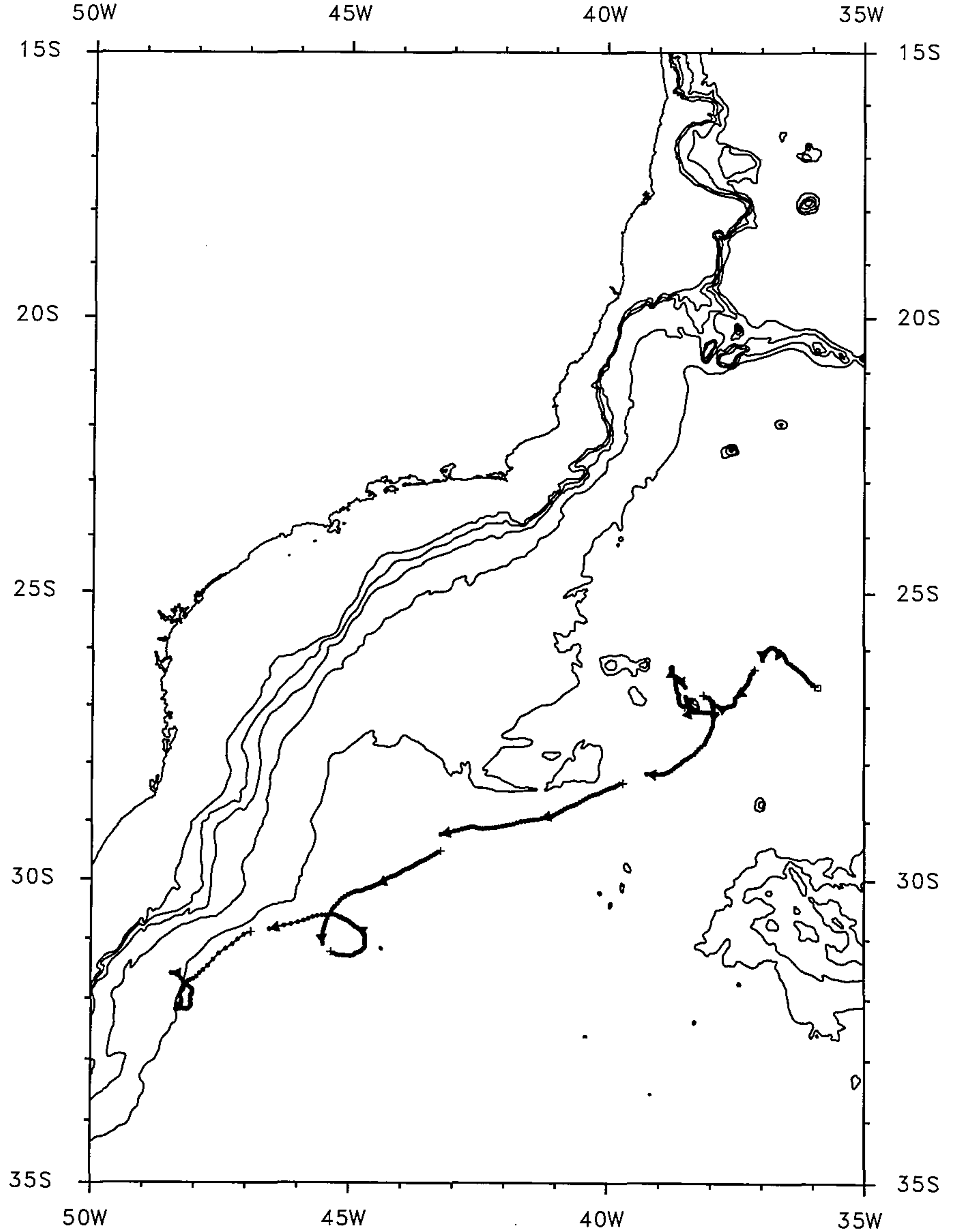
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m104-c1.raw	m104-c1.fin	m104-c1.diaric
m104-c2.raw	m104-c2.fin	m104-c2.diaric
m104-c3.raw	m104-c3.fin	m104-c3.diaric
m104-c4.raw	m104-c4.fin	m104-c4.diaric
m104-c5.raw	m104-c5.fin	m104-c5.diaric
m104-c6.raw	m104-c6.fin	m104-c6.diaric
m104-c7.raw	m104-c7.fin	m104-c7.diaric
m104-c8.raw	m104-c8.fin	m104-c8.diaric
m104-c9.raw	m104-c9.fin	m104-c9.diaric





SAMBA M104 CYCLES 1 TO 9



SAMBA M104 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m104

launch date	launch lat	launch long
1994 2 18 9h UT	26.652 S	35.903 W

file	m104-c1.fin	m104-c2.fin	m104-c3.fin
date of 1st pos	1994 2 19 (16121)	1994 4 22 (16183)	1994 6 23 (16245)
1st pos	35.965W 26.630S	37.138W 26.347S	37.906W 27.092S
last pos	36.987W 26.175S	37.878W 26.978S	38.489W 26.826S
1st P and T	809dbar 4.98degC	808dbar 4.59degC	829dbar 4.73degC
last P and T	821dbar 4.46degC	814dbar 4.87degC	832dbar 4.50degC
displacements (East and North)	-102km 51km	-73km -70km	-58km 30km
mean velocities (East and North)	-2.00cm/s 0.99cm/s	-1.44cm/s -1.38cm/s	-1.13cm/s 0.58cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.53 cm/s [-2.21, -0.85]
average north velocity comp.= 0.07 cm/s [-0.87, 1.00]

variances
variance of east velocity comp.= 1.87 cm2/s2 [0.65, 3.10]
variance of north velocity comp.= 3.57 cm2/s2 [1.24, 5.90]

covariance
covariance= -0.81 cm2/s2 [-2.00, 0.39]

Eddy Kinetic Energy
EKE= 2.72 cm2/s2 [1.40, 4.04]

Temperature time series statistics:

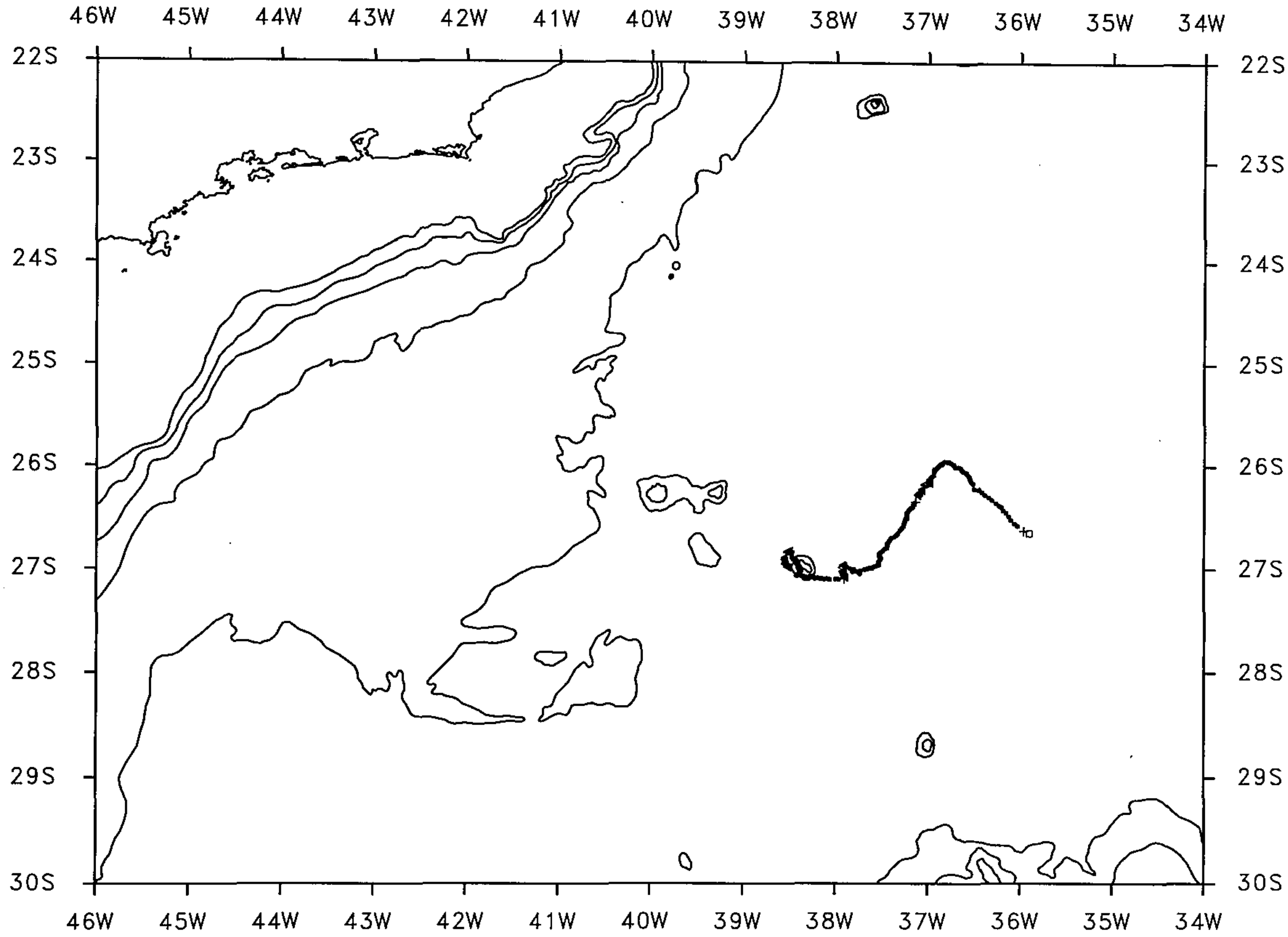
sampling interval= 24 h
number of samples= 167

average temperature= 4.65 degC

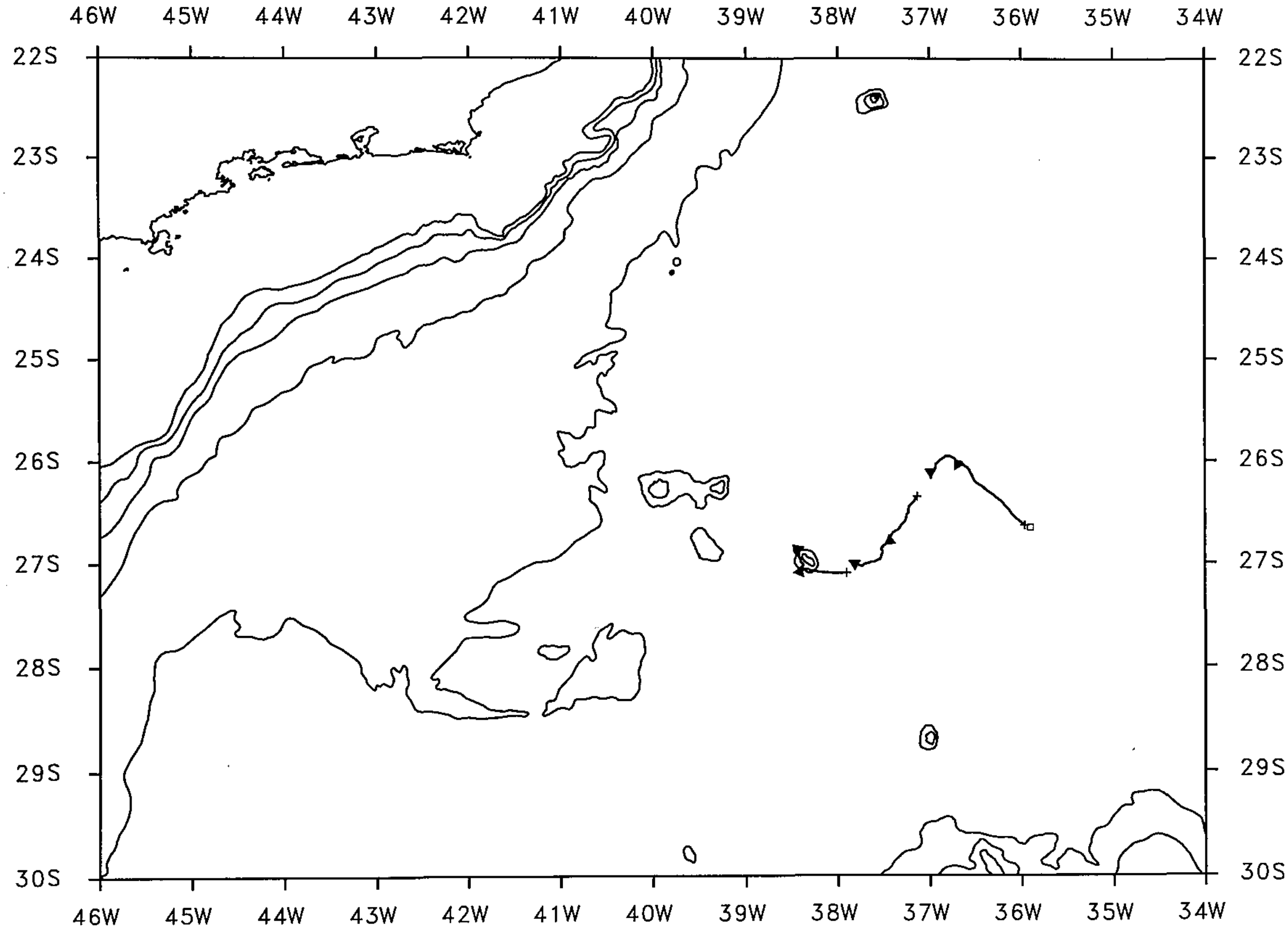
temperature variance= 0.0180 degC*degC

covar(u,temp)= -0.07 cm.degC/s
covar(v,temp)= 0.06 cm.degC/s

Comments:

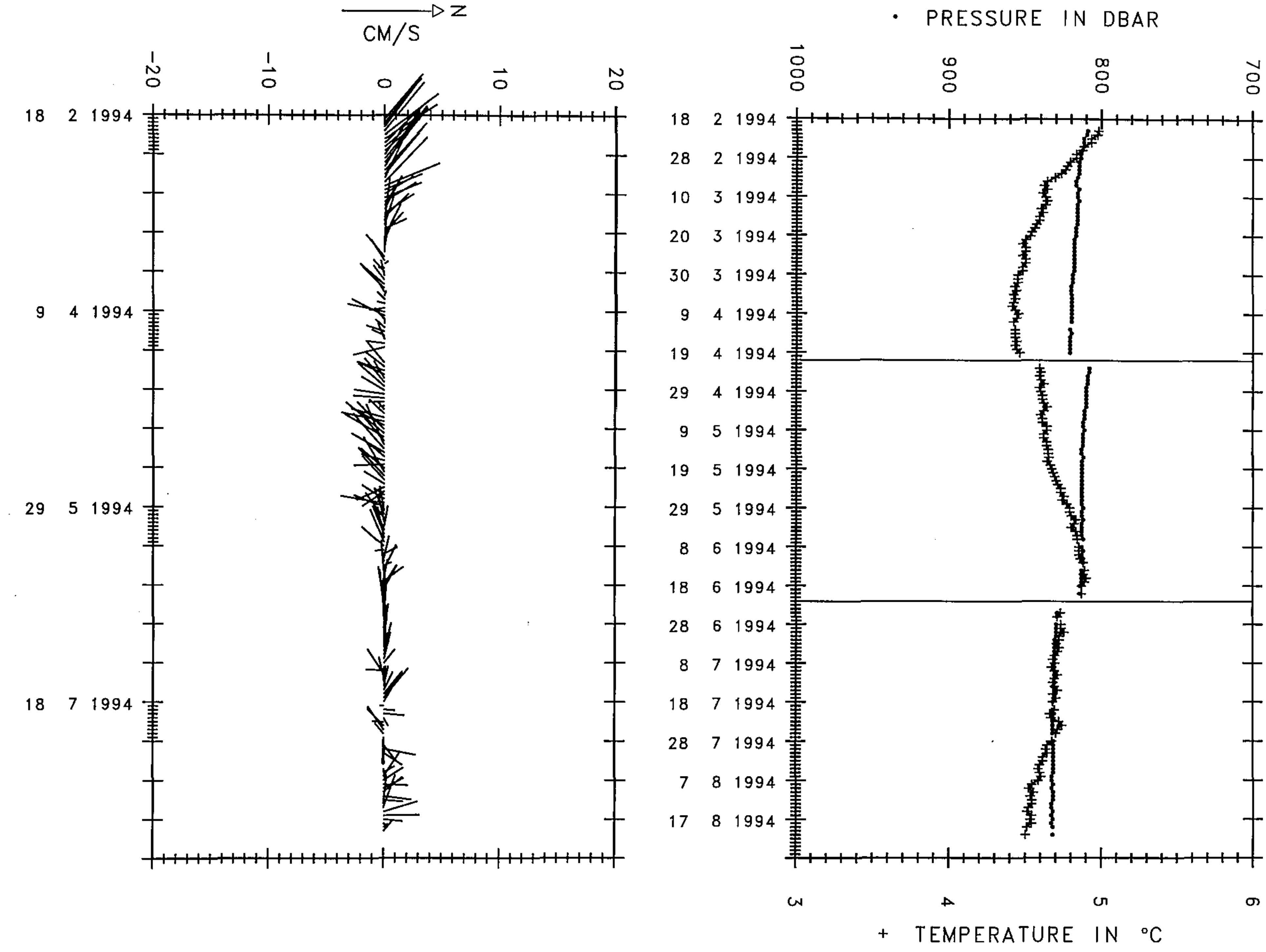


SAMBA M104 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M104 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED

SAMBA M104 CYCLES 1,2 AND 3



EXPERIMENT: SAMBA

FLOAT: m104
----

launch date	launch lat	launch long
1994 2 18 9h UT	26.652 S	35.903 W

file	m104-c4.fin	m104-c5.fin	m104-c6.fin
date of 1st pos	1994 8 24 (16307)	1994 10 25 (16369)	1994 12 26 (16431)
1st pos	38.502W 27.007S	38.132W 26.803S	39.686W 28.333S
last pos	38.493W 26.659S	39.229W 28.175S	43.241W 29.218S
1st P and T	791dbar 4.92degC	809dbar 4.52degC	800dbar 5.04degC
last P and T	795dbar 4.71degC	820dbar 4.96degC	803dbar 5.10degC
displacements (East and North)	1km 39km	-108km -152km	-346km -98km
mean velocities (East and North)	0.02cm/s 0.76cm/s	-2.12cm/s -2.99cm/s	-6.79cm/s -1.93cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -2.97 cm/s [-4.75, -1.19]
average north velocity comp.= -1.38 cm/s [-2.68, -0.09]

variances
variance of east velocity comp.= 12.92 cm2/s2 [4.48, 21.36]
variance of north velocity comp.= 6.83 cm2/s2 [2.37, 11.30]

covariance
covariance= 1.73 cm2/s2 [-2.61, 6.07]

Eddy Kinetic Energy
EKE= 9.88 cm2/s2 [5.10, 14.65]

Temperature time series statistics:
----

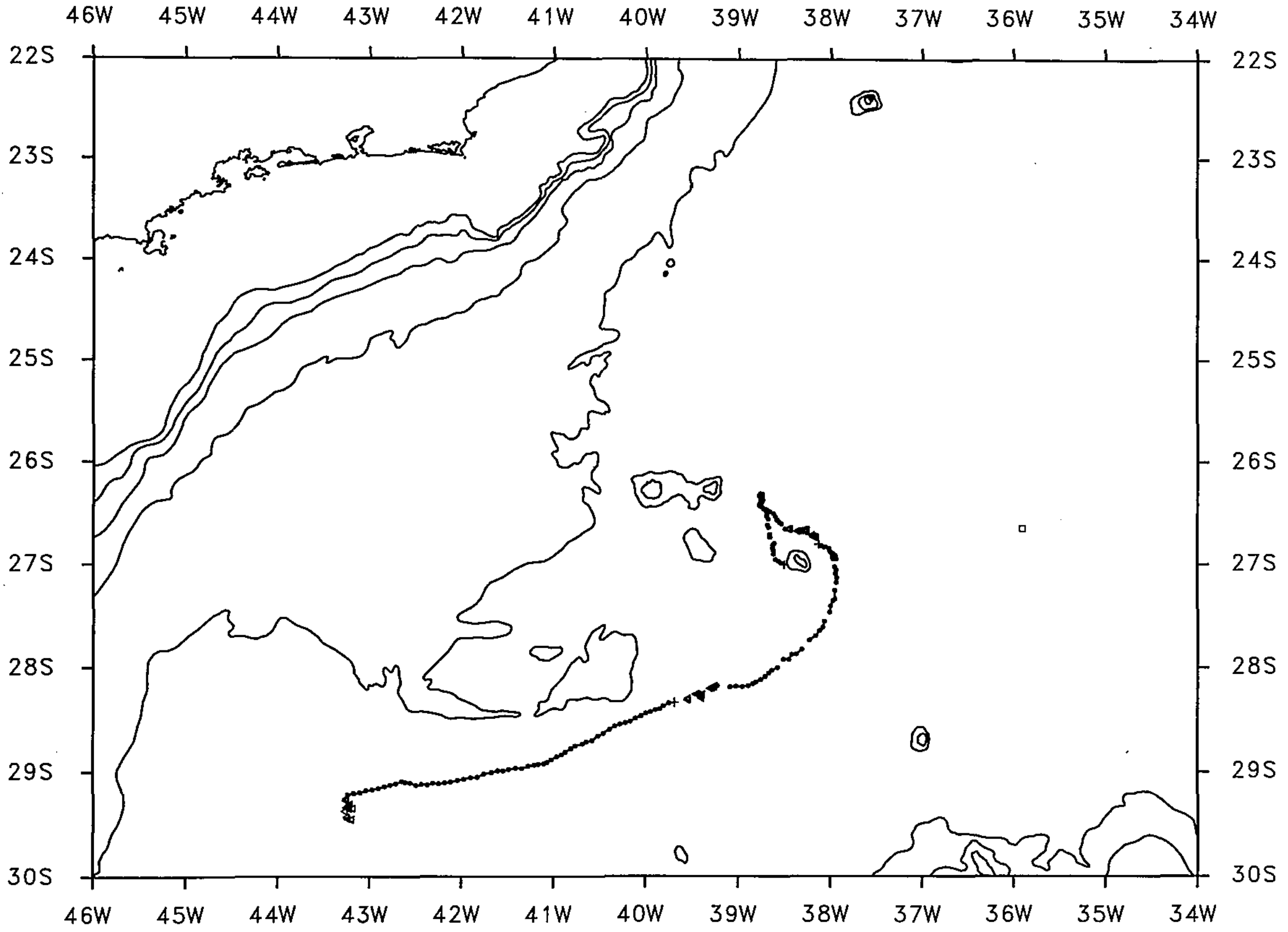
sampling interval= 24 h
number of samples= 157

average temperature= 4.90 degC

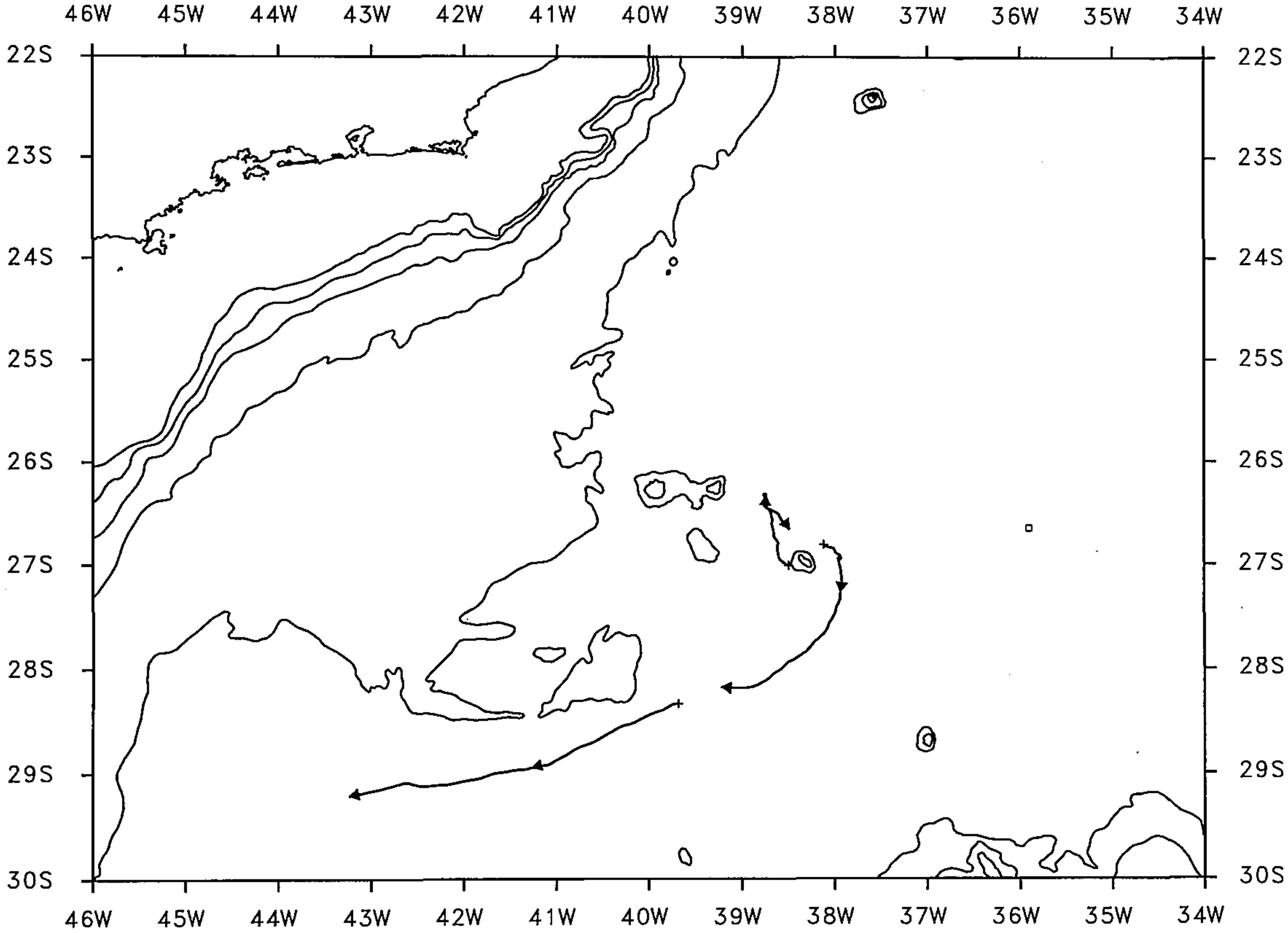
temperature variance= 0.0541 degC*degC

covar(u,temp)= -0.75 cm.degC/s
covar(v,temp)= -0.05 cm.degC/s

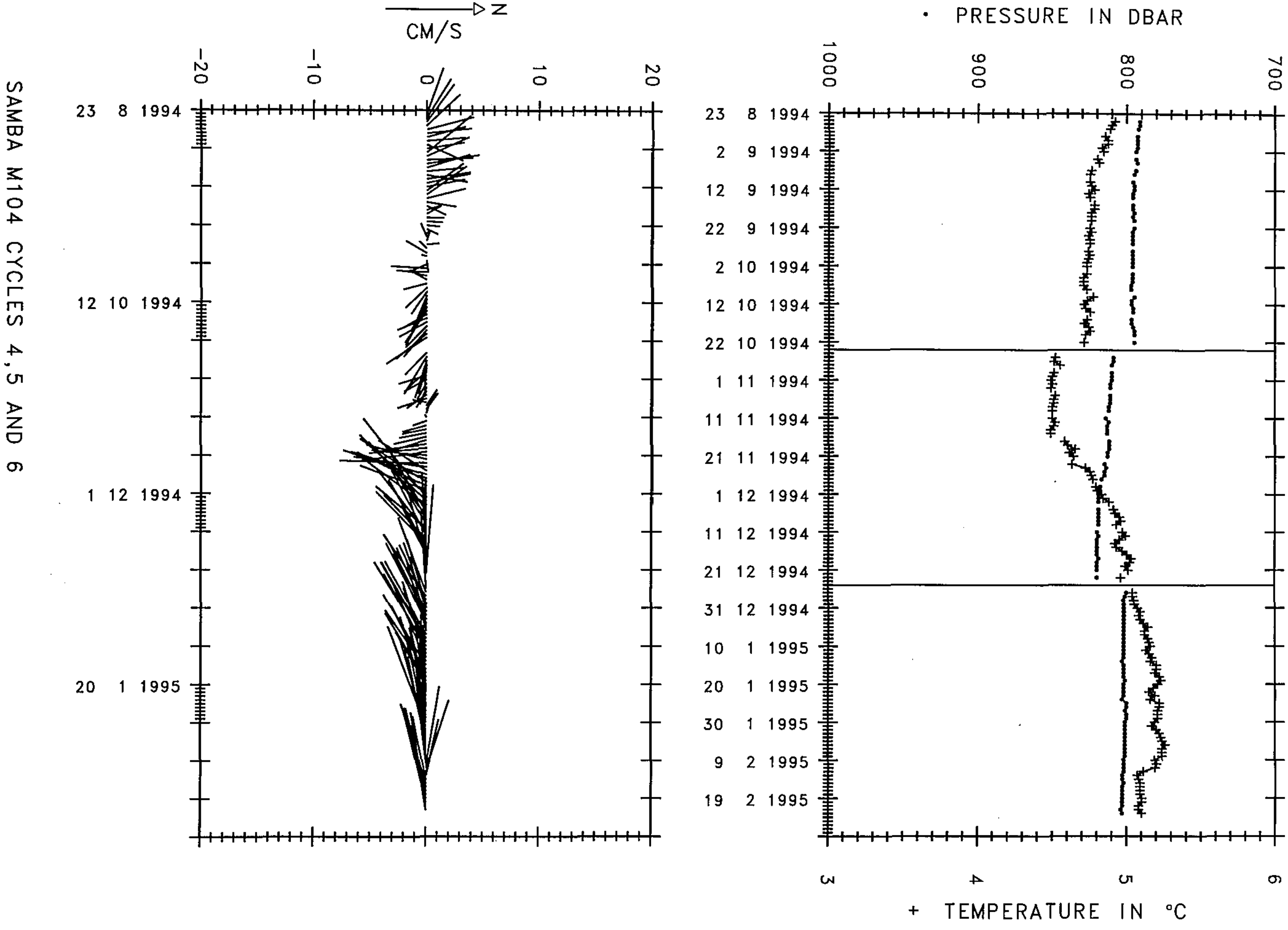
Comments:



SAMBA M104 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M104 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED


SAMBA M104 CYCLES 4,5 AND 6
N
CM/S
-20
-10
0
10
20
PRESSURE IN DBAR
1000
900
800
700
23 8 1994
2 9 1994
12 9 1994
22 9 1994
2 10 1994
12 10 1994
22 10 1994
1 11 1994
11 11 1994
21 11 1994
1 12 1994
11 12 1994
21 12 1994
31 12 1994
10 1 1995
20 1 1995
30 1 1995
9 2 1995
19 2 1995
3
4
5
6
+ TEMPERATURE IN °C

EXPERIMENT: SAMBA

FLOAT: m104
----

launch date	launch lat	launch long
1994 2 18 9h UT	26.652 S	35.903 W

file	m104-c7.fin	m104-c8.fin	m104-c9.fin
date of 1st pos	1995 2 26 (16493)	1995 4 29 (16555)	1995 6 30 (16617)
1st pos	43.242W 29.504S	45.347W 31.218S	46.902W 30.886S
last pos	45.511W 31.091S	46.541W 30.837S	48.436W 31.584S
1st P and T	824dbar 4.96degC	807dbar 5.60degC	811dbar 5.51degC
last P and T	827dbar 5.40degC	815dbar 5.43degC	827dbar 4.83degC
displacements (East and North)	-218km -176km	-114km 42km	-146km -78km
mean velocities (East and North)	-4.27cm/s -3.46cm/s	-2.23cm/s 0.83cm/s	-2.86cm/s -1.52cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.18 cm/s [-5.45, -0.91]
average north velocity comp.= -1.42 cm/s [-3.28, 0.44]

variances
variance of east velocity comp.= 20.97 cm2/s2 [7.27, 34.67]
variance of north velocity comp.= 14.09 cm2/s2 [4.89, 23.30]

covariance
covariance= 8.09 cm2/s2 [0.14, 16.03]

Eddy Kinetic Energy
EKE= 17.53 cm2/s2 [9.28, 25.79]

Temperature time series statistics:
----

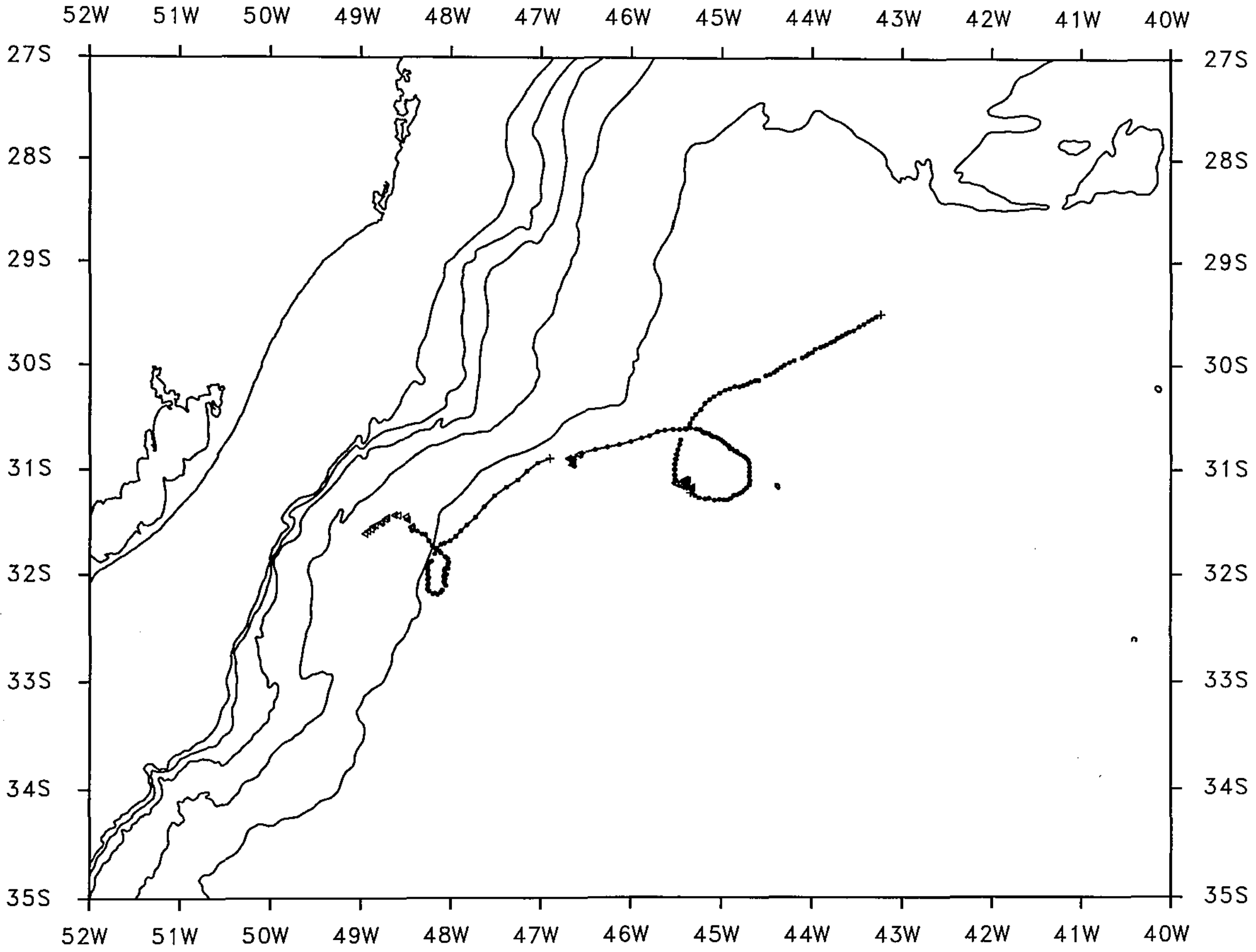
sampling interval= 24 h
number of samples= 177

average temperature= 5.25 degC

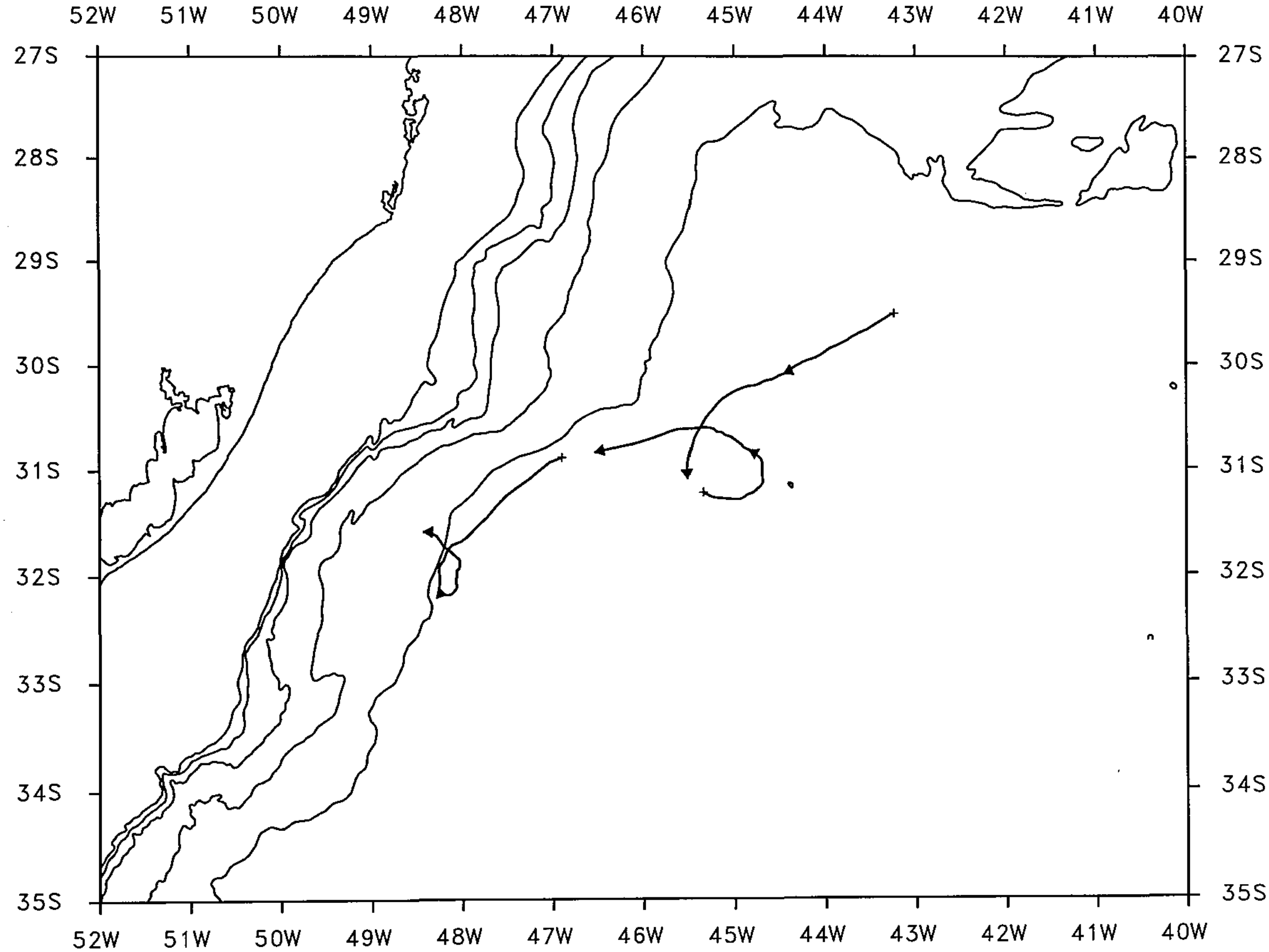
temperature variance= 0.0507 degC*degC

covar(u,temp)= 0.17 cm.degC/s
covar(v,temp)= -0.17 cm.degC/s

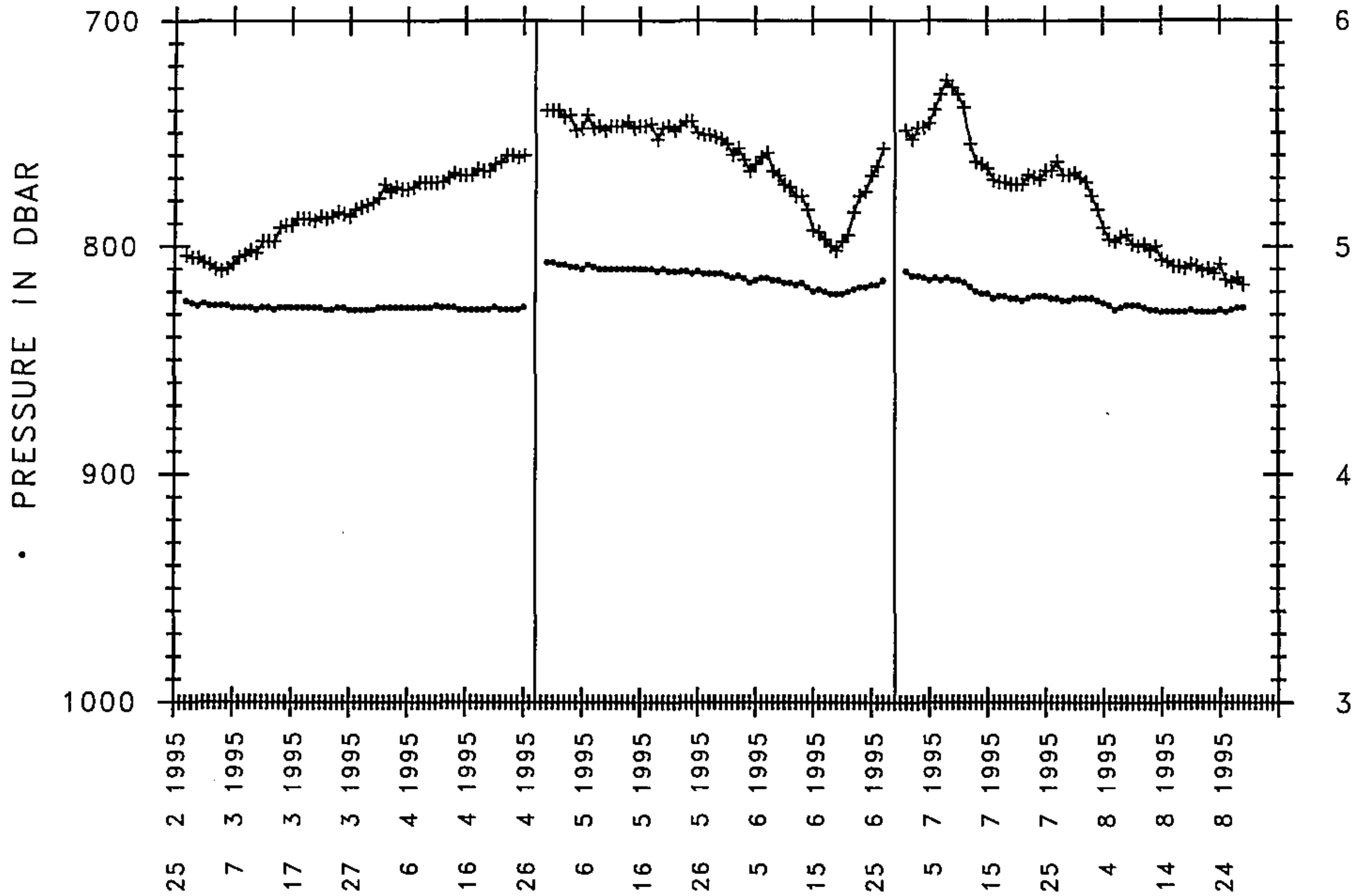
Comments:

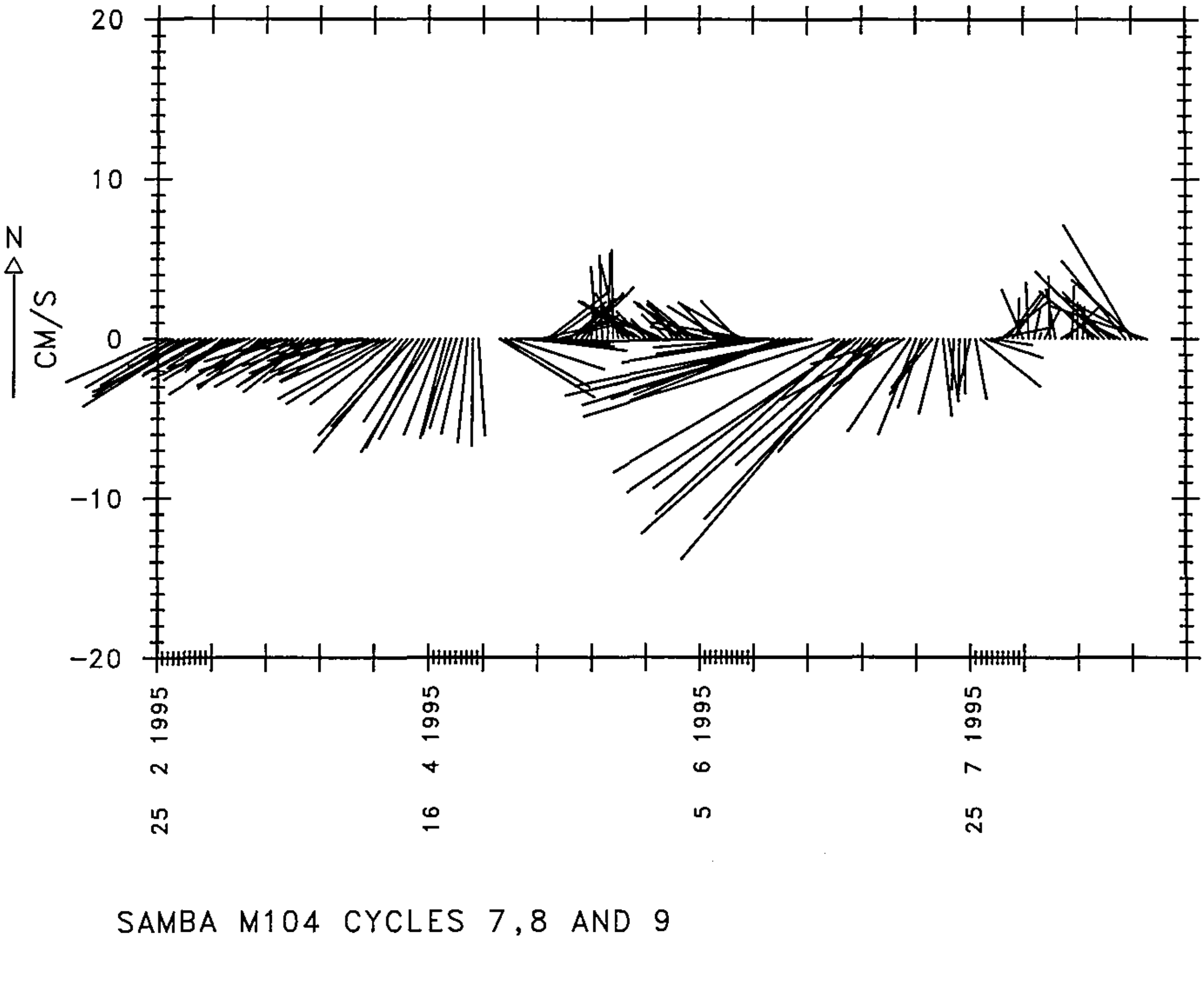


SAMBA M104 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M104 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M104 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #105

LAUNCHED AT: 26°19.9'S 35°55.0'W on 18/02/1994 10h56 UT

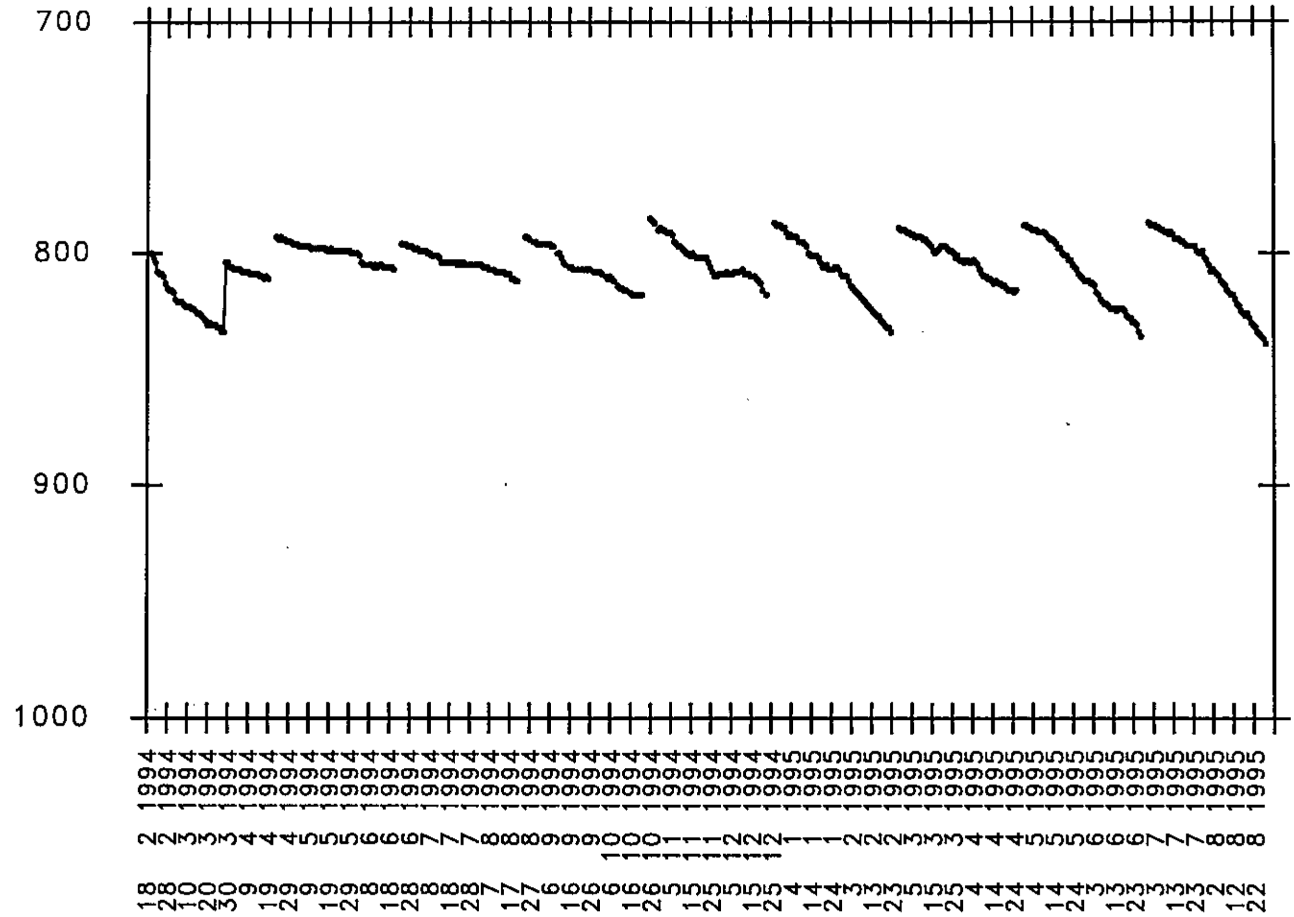
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

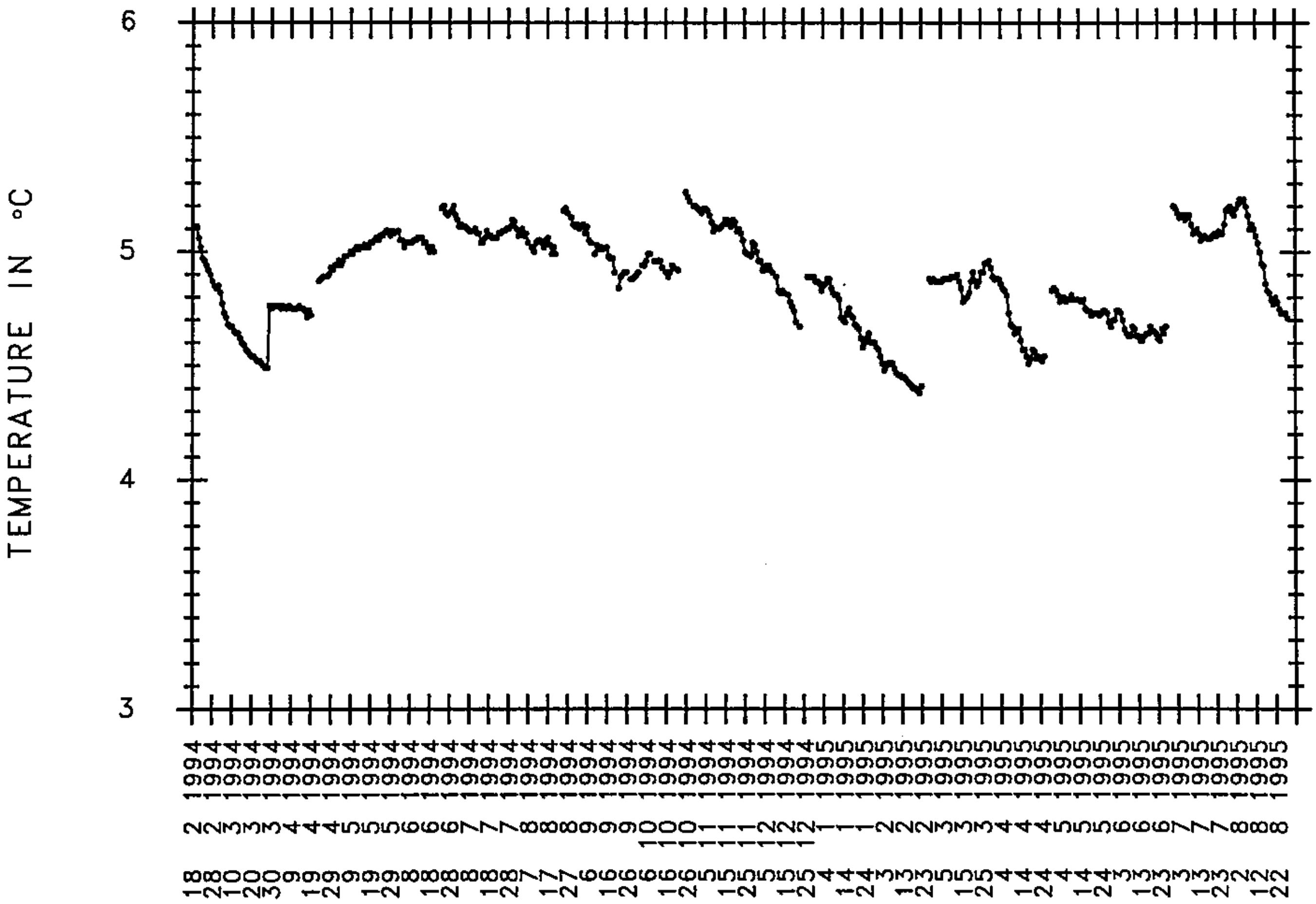
Comments

This float shows a rather sluggish westward motion. EKE values are of a few $cm^2\ s^{-2}$ only.

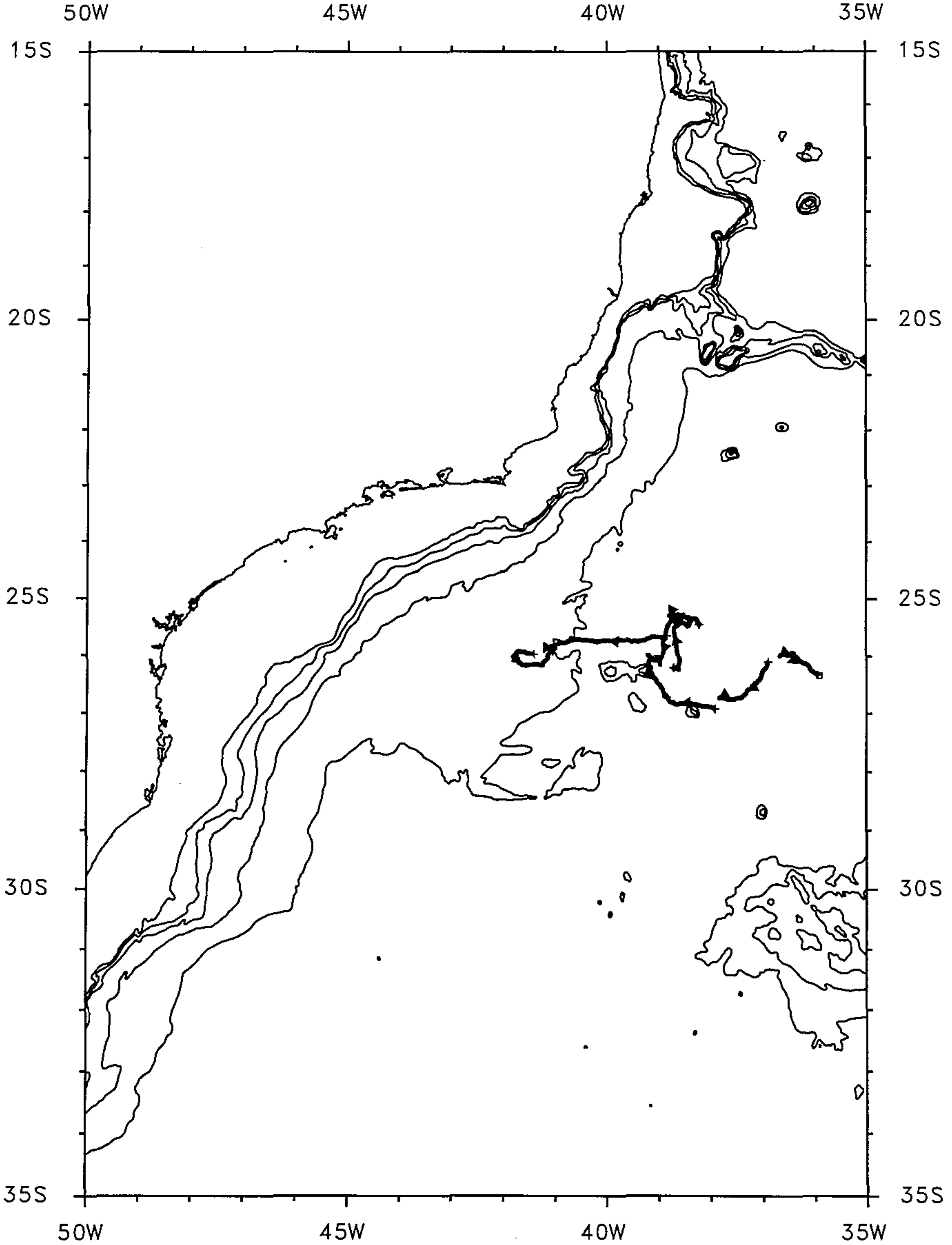
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m105-c1.raw	m105-c1.fin	m105-c1.diaric
m105-c2.raw	m105-c2.fin	m105-c2.diaric
m105-c3.raw	m105-c3.fin	m105-c3.diaric
m105-c4.raw	m105-c4.fin	m105-c4.diaric
m105-c5.raw	m105-c5.fin	m105-c5.diaric
m105-c6.raw	m105-c6.fin	m105-c6.diaric
m105-c7.raw	m105-c7.fin	m105-c7.diaric
m105-c8.raw	m105-c8.fin	m105-c8.diaric
m105-c9.raw	m105-c9.fin	m105-c9.diaric





SAMBA M105 CYCLES 1 TO 9



SAMBA M105 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m105

launch date	launch lat	launch long
1994 2 18 11h UT	26.332 S	35.917 W

file	m105-c1.fin	m105-c2.fin	m105-c3.fin
date of 1st pos	1994 2 19 (16121)	1994 4 22 (16183)	1994 6 23 (16245)
1st pos	35.944W 26.320S	36.899W 26.103S	37.918W 26.923S
last pos	36.675W 25.998S	37.833W 26.732S	38.889W 26.709S
1st P and T	800dbar 5.11degC	793dbar 4.87degC	796dbar 5.19degC
last P and T	811dbar 4.72degC	807dbar 5.00degC	812dbar 4.99degC
displacements (East and North)	-73km 36km	-93km -70km	-96km 24km
mean velocities (East and North)	-1.43cm/s 0.70cm/s	-1.82cm/s -1.37cm/s	-1.99cm/s 0.49cm/s
number of pos	60	60	57

Velocity time series statistics:

sampling interval= 24 h
number of samples= 177

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.75 cm/s [-2.24, -1.26]
average north velocity comp.= -0.09 cm/s [-0.82, 0.64]

variances
variance of east velocity comp.= 0.98 cm2/s2 [0.34, 1.63]
variance of north velocity comp.= 2.17 cm2/s2 [0.75, 3.59]

covariance
covariance= -0.18 cm2/s2 [-0.85, 0.50]

Eddy Kinetic Energy
EKE= 1.58 cm2/s2 [0.80, 2.36]

Temperature time series statistics:

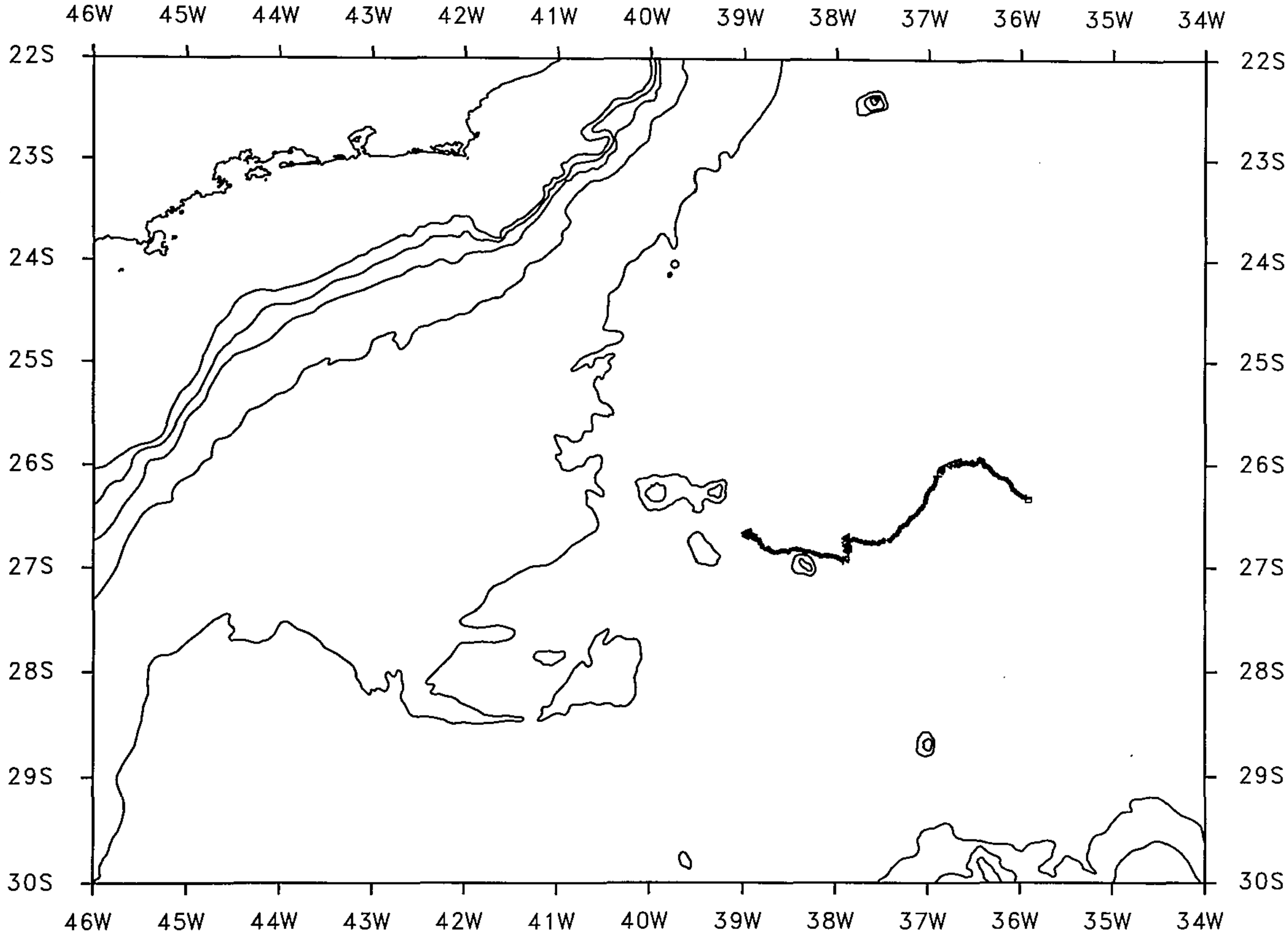
sampling interval= 24 h
number of samples= 170

average temperature= 4.94 degC

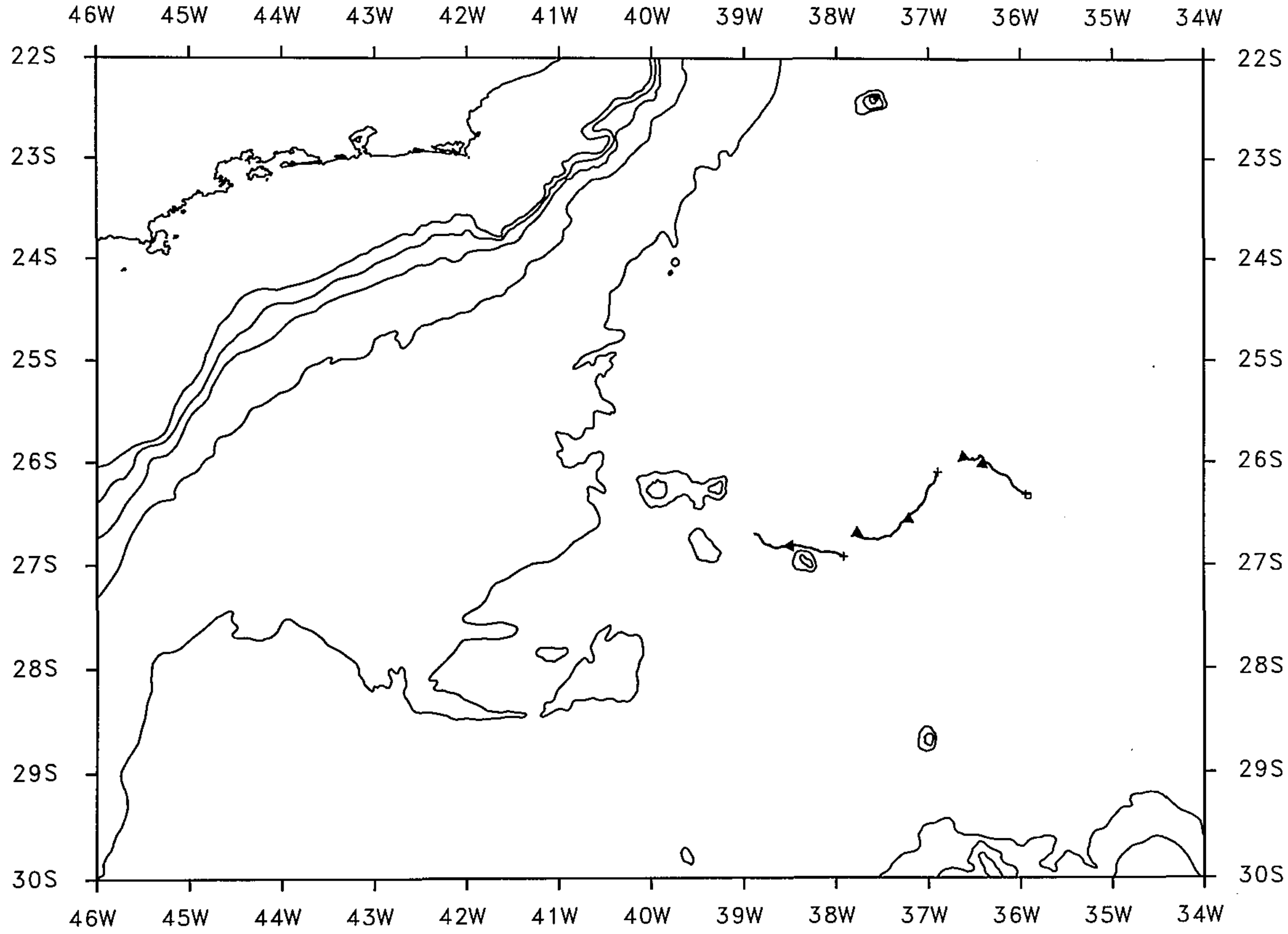
temperature variance= 0.0341 degC*degC

covar(u,temp)= -0.07 cm.degC/s
covar(v,temp)= -0.03 cm.degC/s

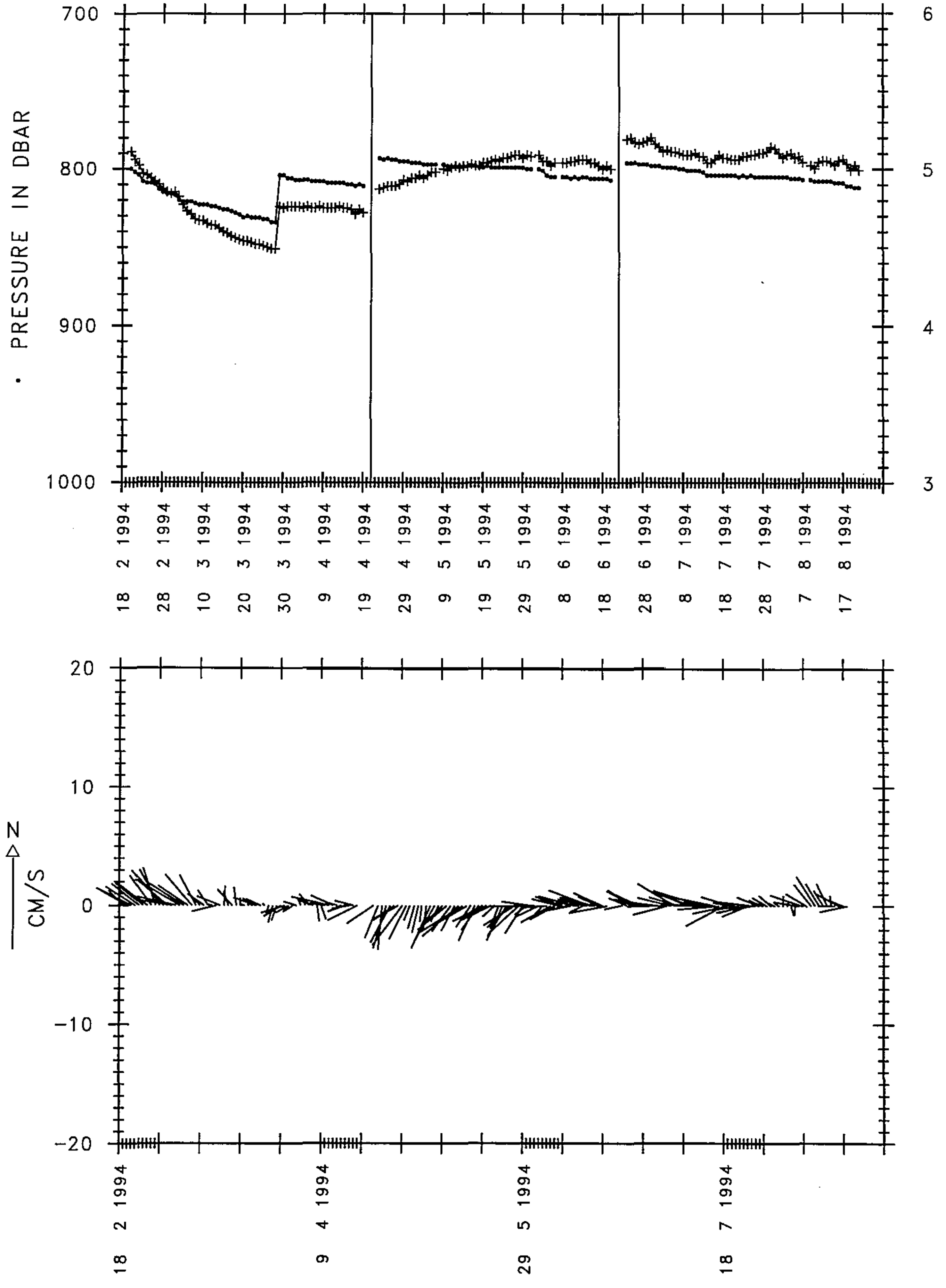
Comments:



SAMBA M105 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M105 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M105 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m105
----

launch date	launch lat	launch long
1994 2 18 11h UT	26.332 S	35.917 W

file	m105-c4.fin	m105-c5.fin	m105-c6.fin
date of 1st pos	1994 8 24 (16307)	1994 10 25 (16369)	1994 12 26 (16431)
1st pos	38.839W 26.718S	38.711W 26.208S	38.213W 25.448S
last pos	38.975W 26.154S	38.404W 25.461S	38.784W 25.295S
1st P and T	793dbar 5.18degC	785dbar 5.26degC	787dbar 4.89degC
last P and T	818dbar 4.92degC	818dbar 4.67degC	834dbar 4.41degC
displacements (East and North)	-14km 63km	31km 83km	-57km 17km
mean velocities (East and North)	-0.27cm/s 1.23cm/s	0.62cm/s 1.69cm/s	-1.12cm/s 0.33cm/s
number of pos	60	58	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 178

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.27 cm/s [-1.00, 0.46]
average north velocity comp.= 1.05 cm/s [0.13, 1.97]

variances
variance of east velocity comp.= 2.17 cm2/s2 [0.75, 3.58]
variance of north velocity comp.= 3.42 cm2/s2 [1.18, 5.65]

covariance
covariance= -0.67 cm2/s2 [-1.92, 0.59]

Eddy Kinetic Energy
EKE= 2.79 cm2/s2 [1.47, 4.11]

Temperature time series statistics:
----

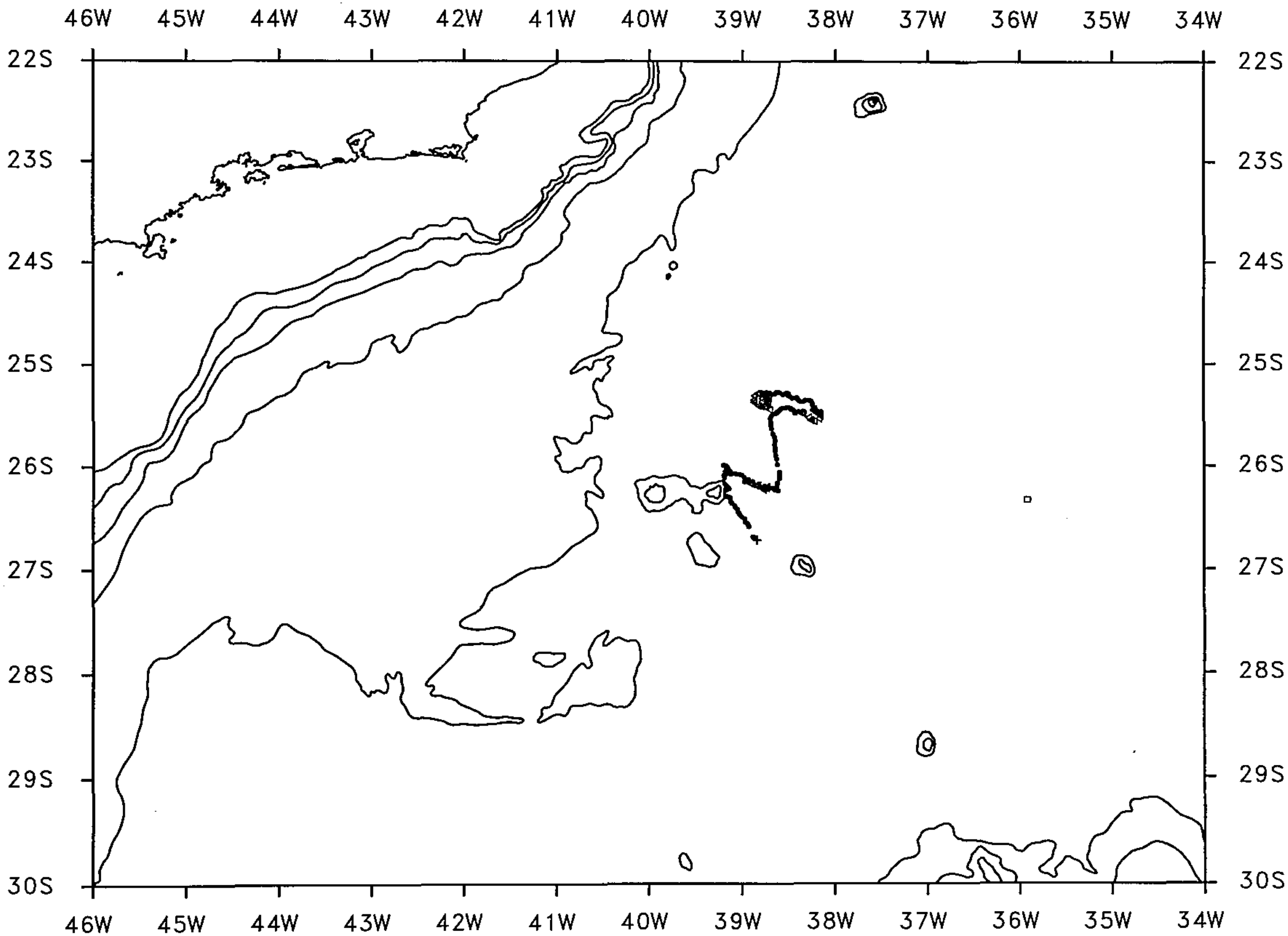
sampling interval= 24 h
number of samples= 162

average temperature= 4.87 degC

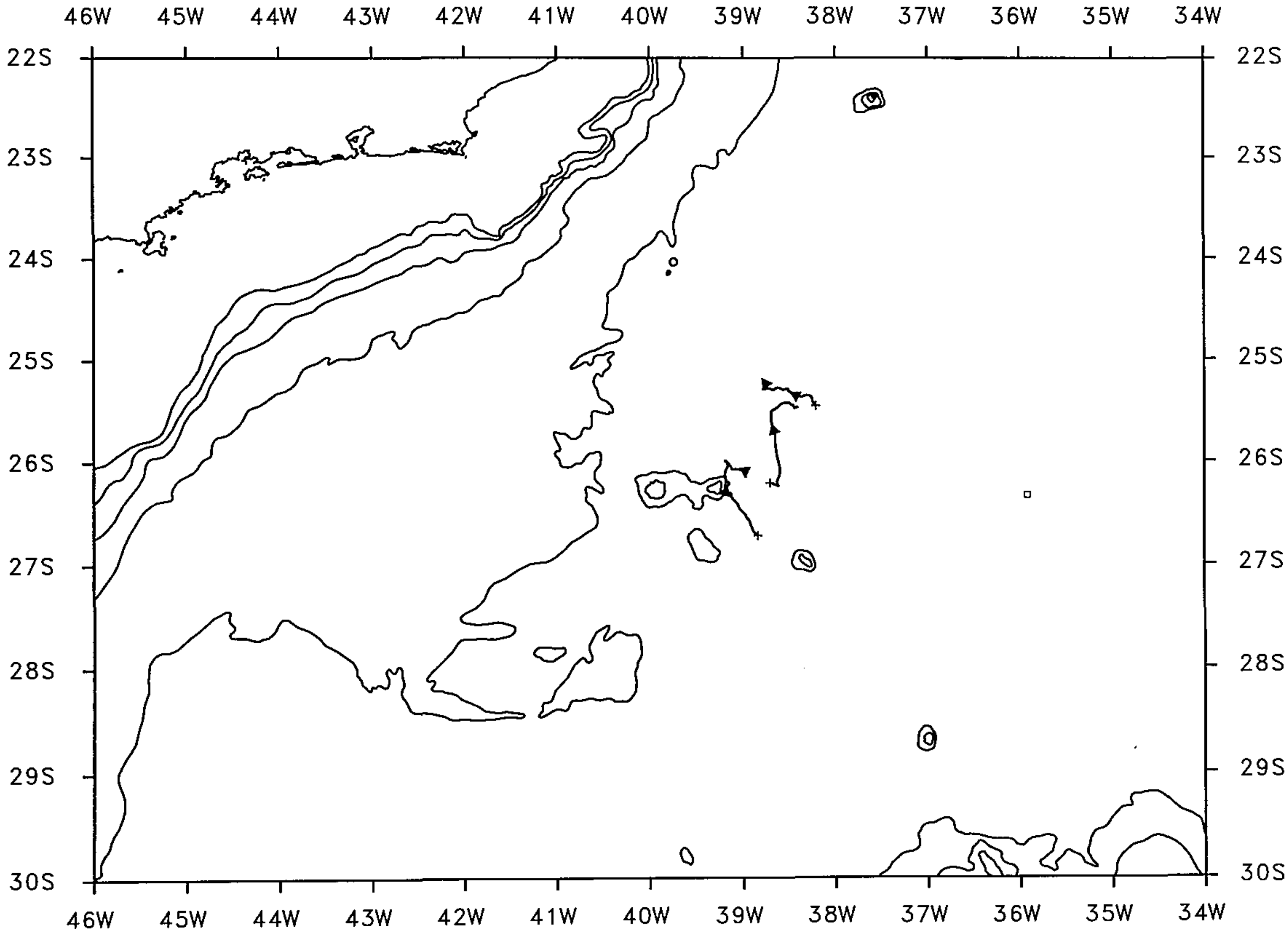
temperature variance= 0.0527 degC*degC

covar(u,temp)= 0.08 cm.degC/s
covar(v,temp)= 0.18 cm.degC/s

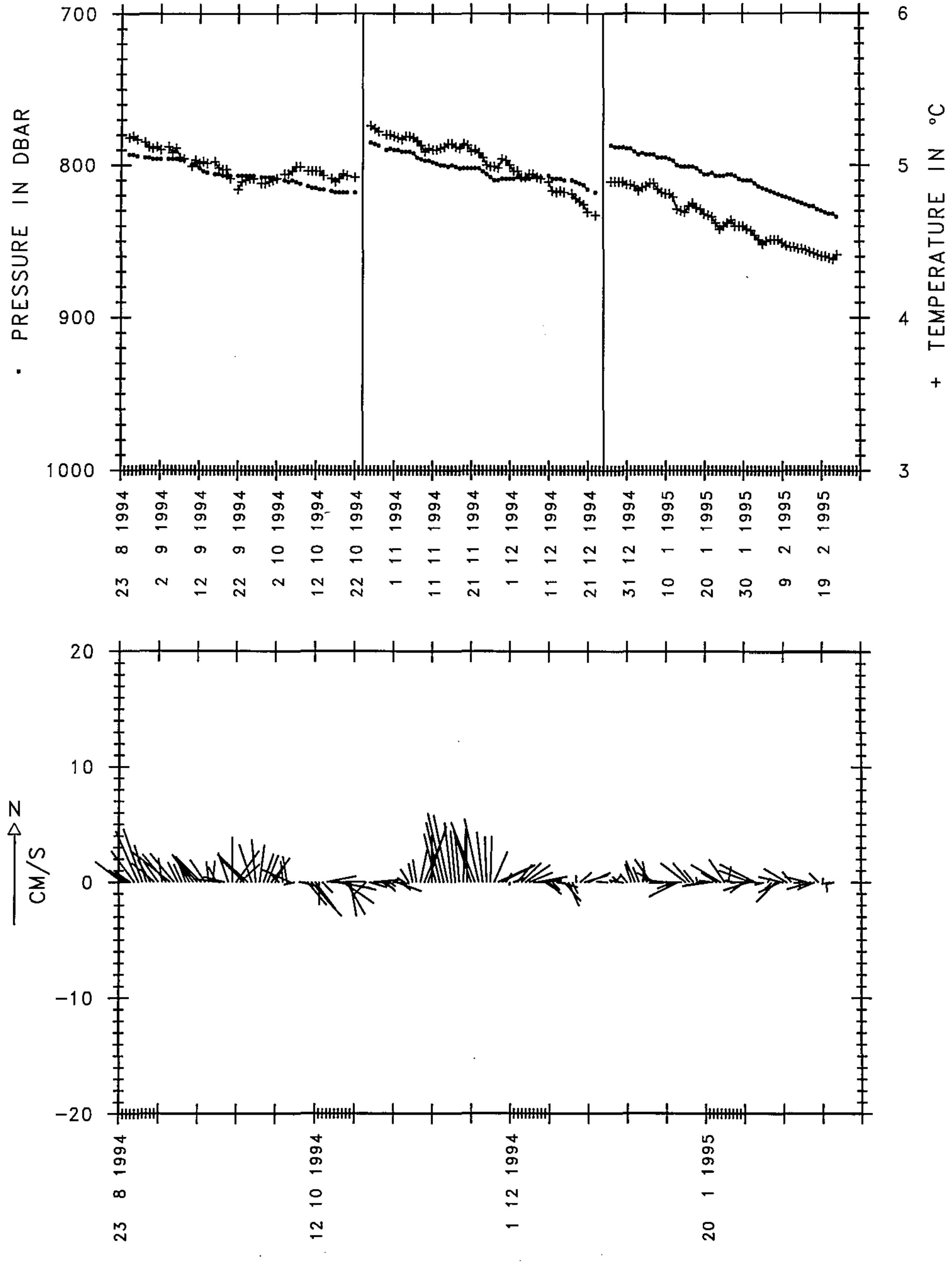
Comments:



SAMBA M105 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M105 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M105 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m105

launch date	launch lat	launch long
1994 2 18 11h UT	26.332 S	35.917 W

file	m105-c7.fin	m105-c8.fin	m105-c9.fin
date of 1st pos	1995 2 26 (16493)	1995 4 29 (16555)	1995 6 30 (16617)
1st pos	38.660W 25.408S	38.834W 25.651S	41.405W 25.976S
last pos	38.908W 25.951S	41.161W 25.845S	41.040W 25.854S
1st P and T	789dbar 4.88degC	788dbar 4.83degC	787dbar 5.20degC
last P and T	816dbar 4.54degC	836dbar 4.67degC	839dbar 4.71degC
displacements (East and North)	-25km -60km	-233km -22km	36km 14km
mean velocities (East and North)	-0.49cm/s -1.18cm/s	-4.57cm/s -0.42cm/s	0.72cm/s 0.27cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.46 cm/s [-2.88, -0.03]
average north velocity comp.= -0.44 cm/s [-1.33, 0.46]

variances
variance of east velocity comp.= 8.29 cm2/s2 [2.87, 13.70]
variance of north velocity comp.= 3.27 cm2/s2 [1.13, 5.40]

covariance
covariance= 0.55 cm2/s2 [-1.85, 2.95]

Eddy Kinetic Energy
EKE= 5.78 cm2/s2 [2.87, 8.69]

Temperature time series statistics:

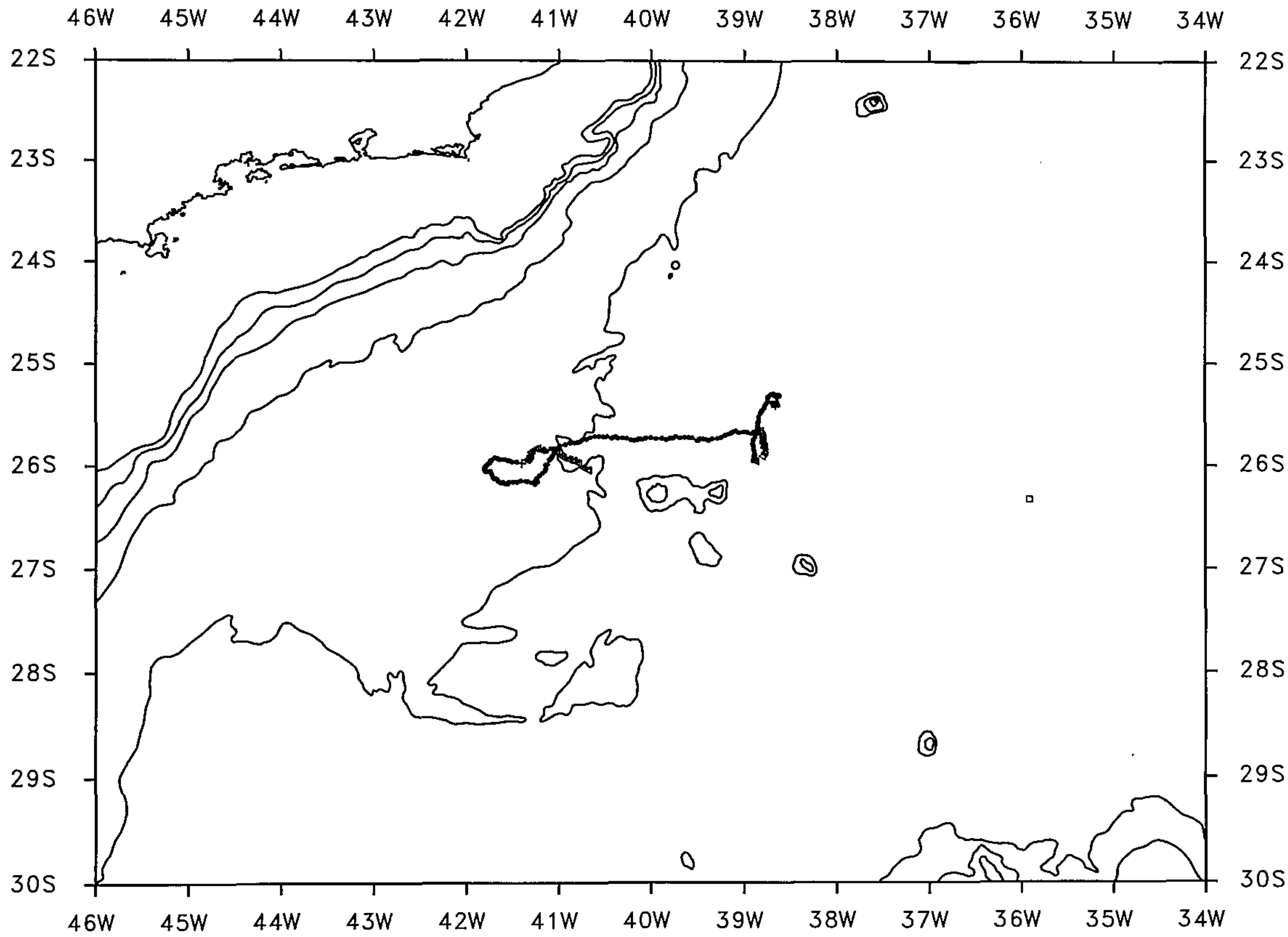
sampling interval= 24 h
number of samples= 177

average temperature= 4.85 degC

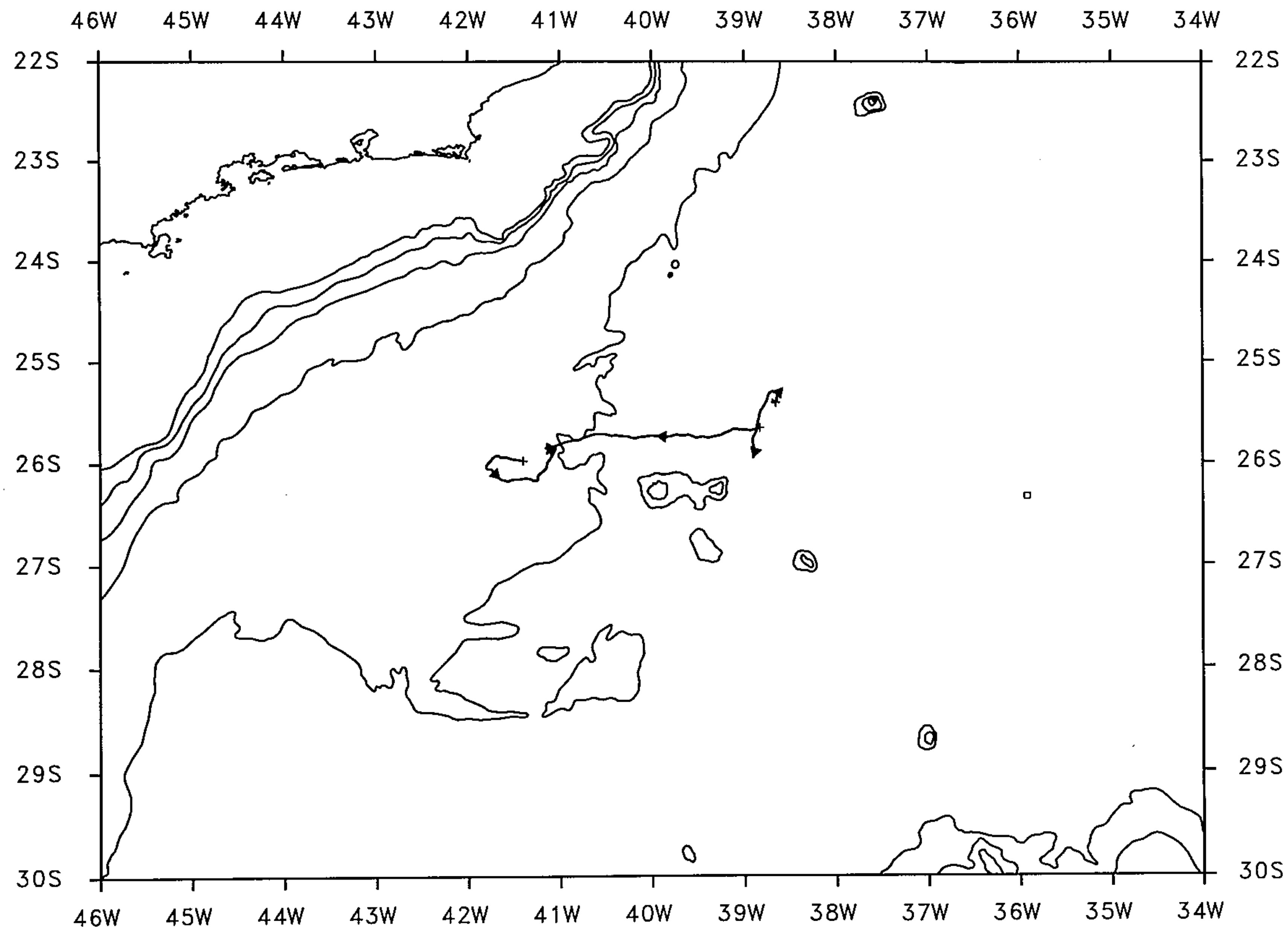
temperature variance= 0.0371 degC*degC

covar(u,temp)= 0.26 cm.degC/s
covar(v,temp)= 0.07 cm.degC/s

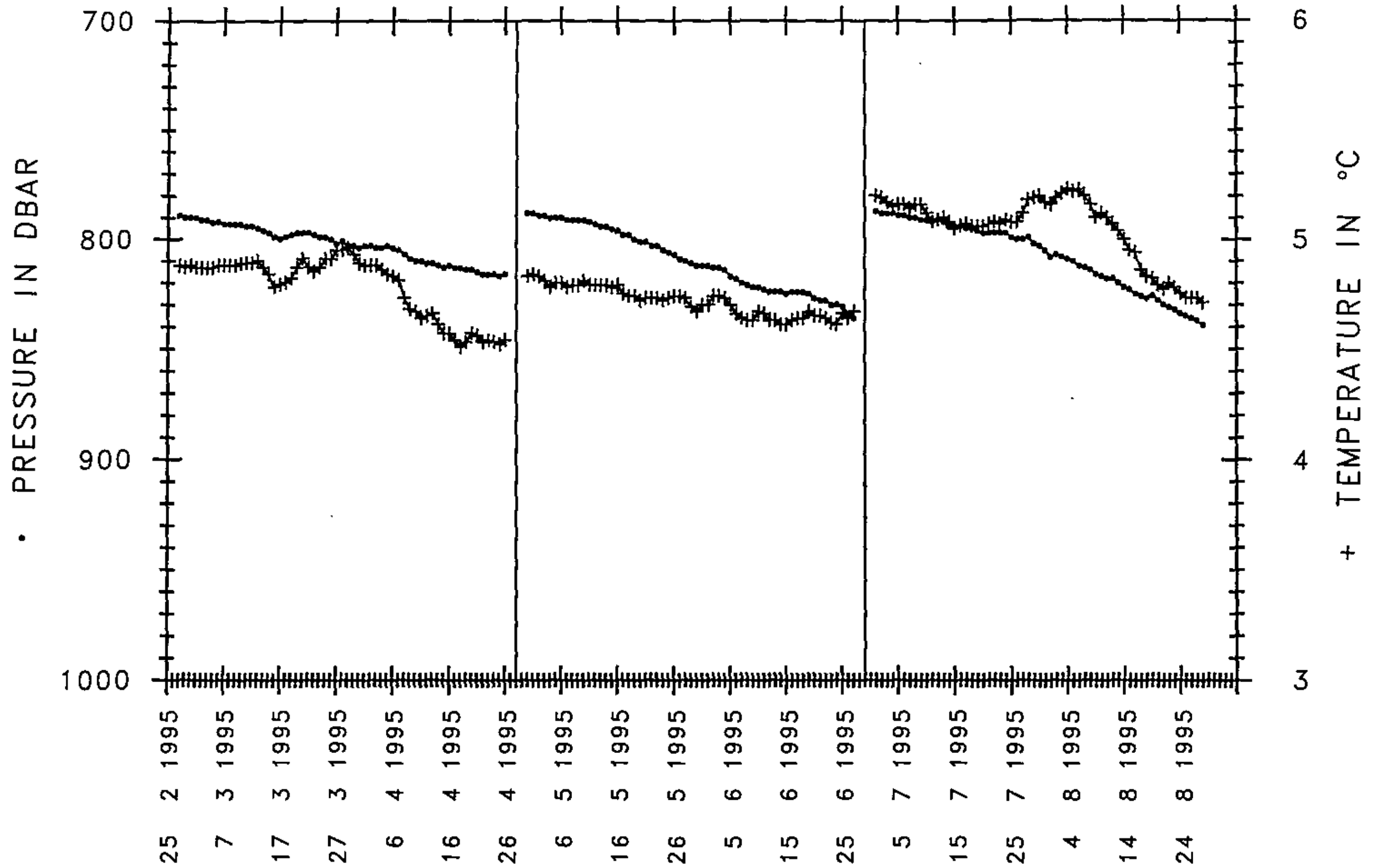
Comments:

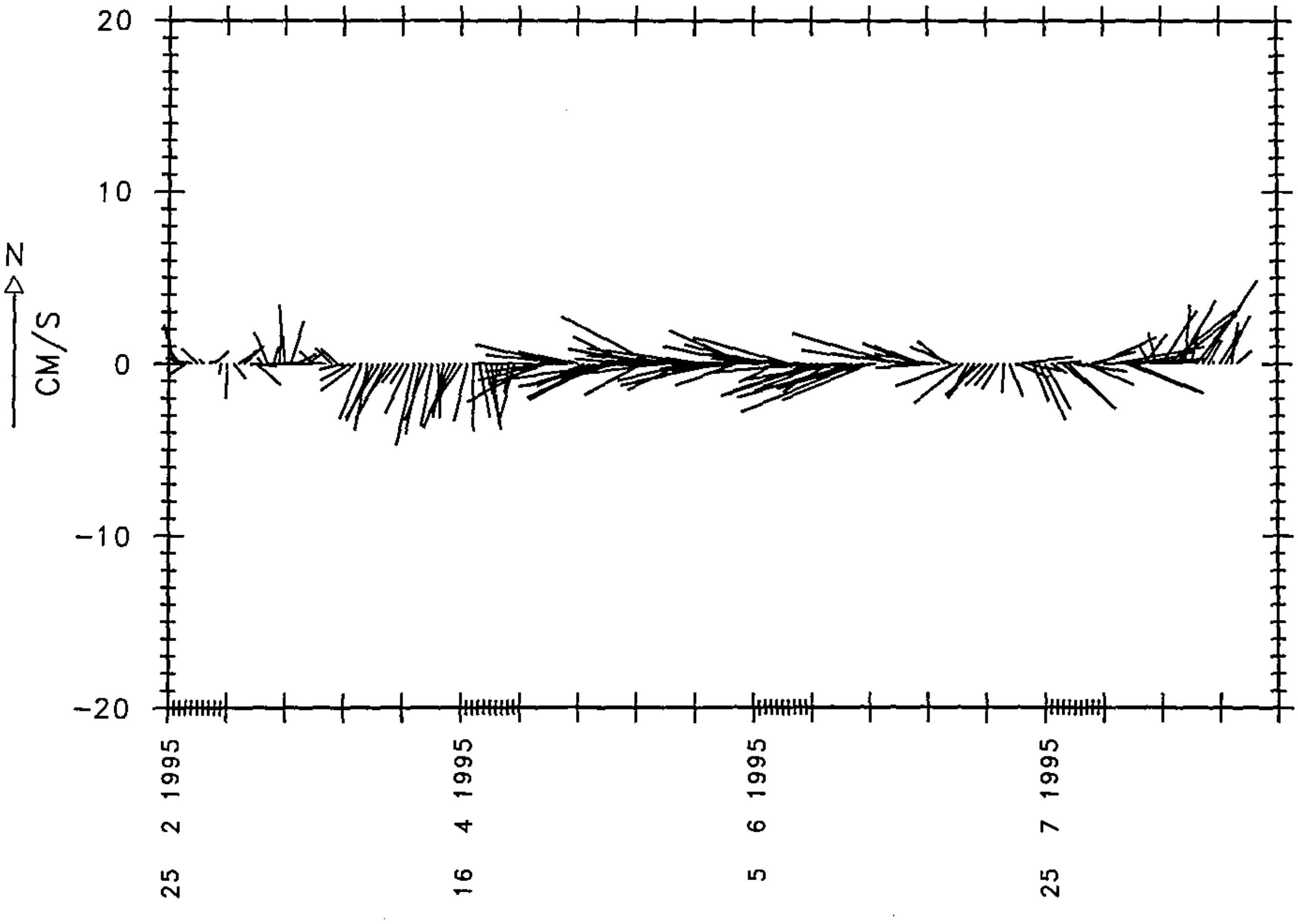


SAMBA M105 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M105 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M105 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #106

LAUNCHED AT: 22°41.0'S 32°58.0'W on 19/02/1994 13h04 UT

Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

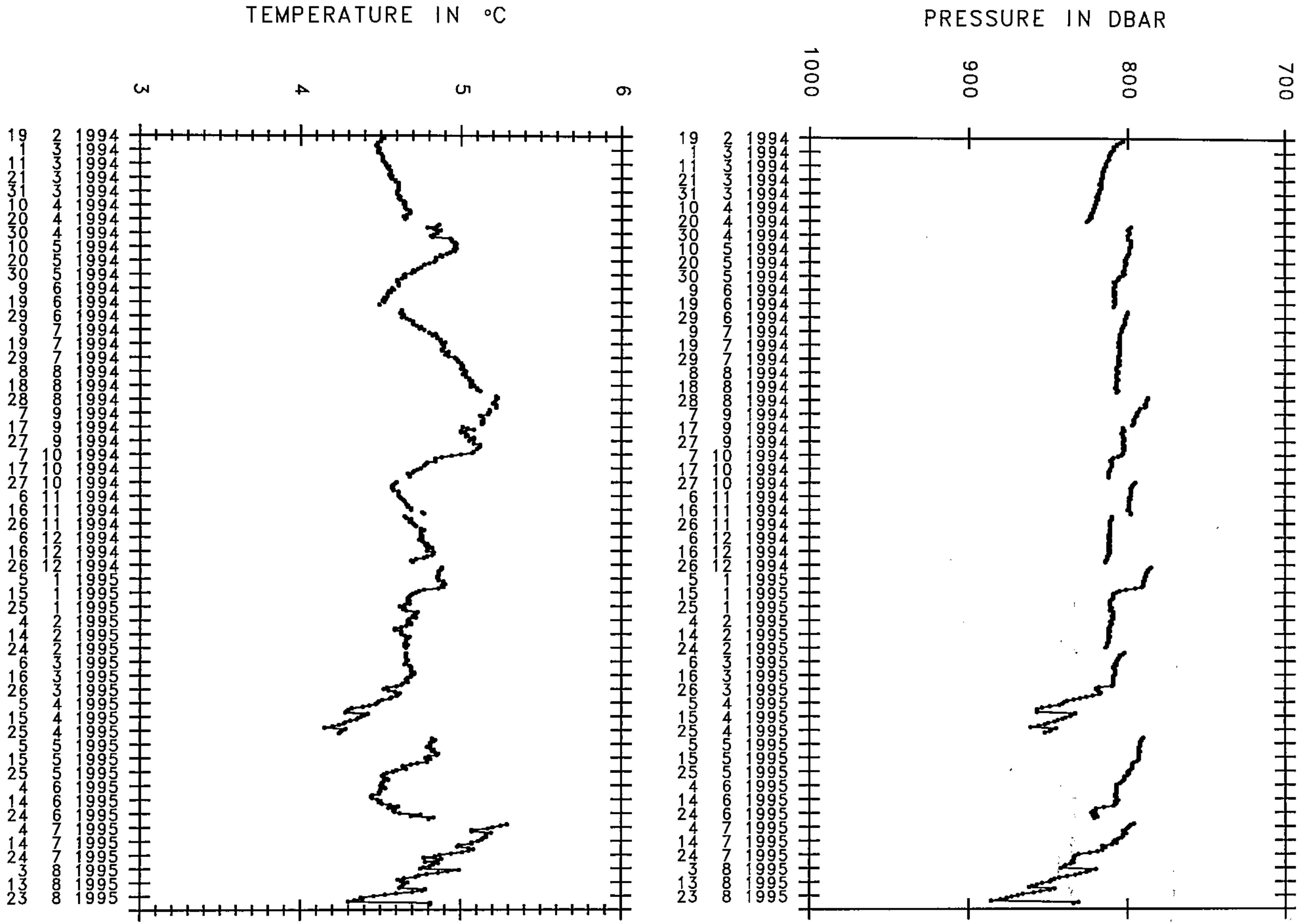
Comments

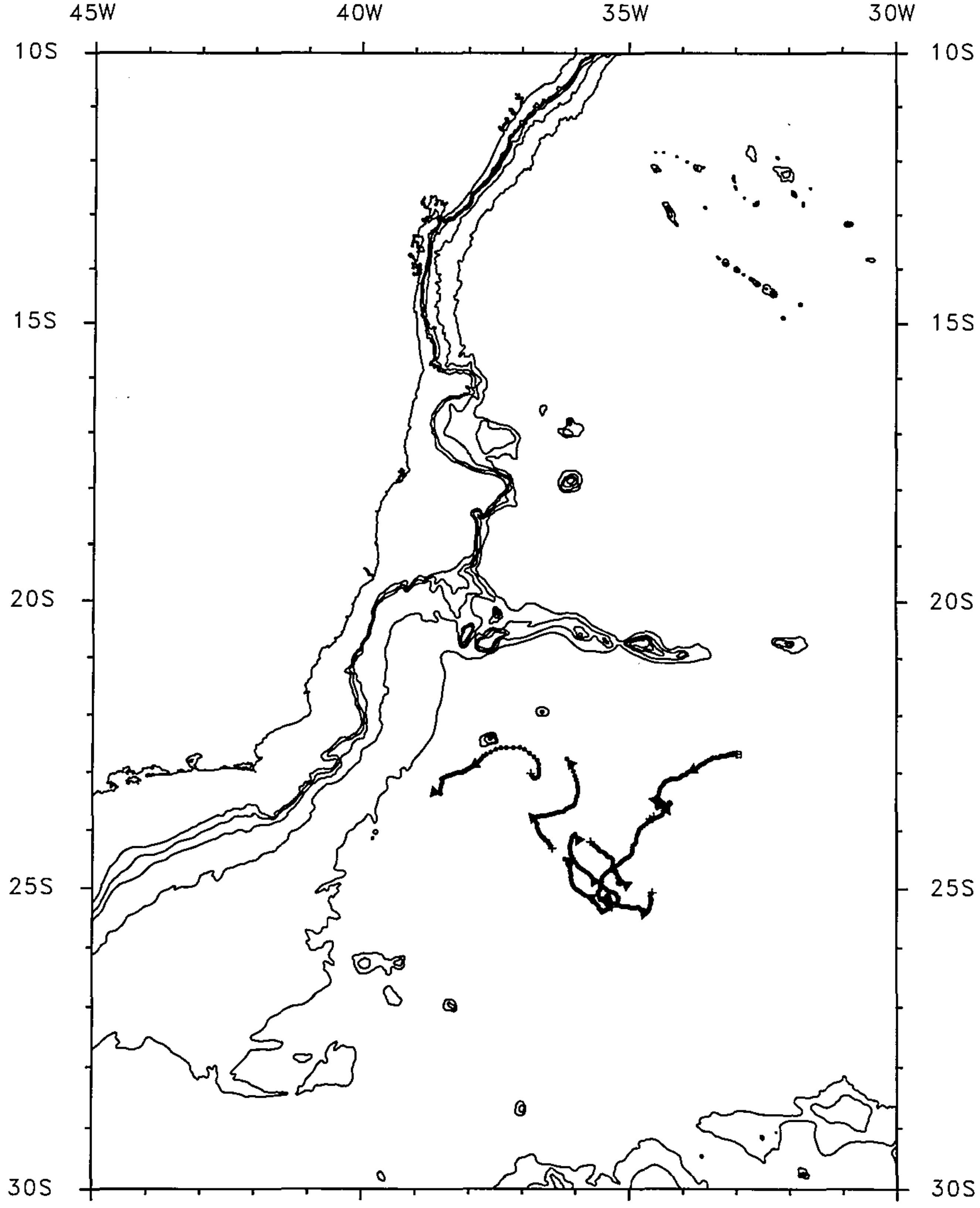
This float, launched within the second cluster, departs significantly from the other four (MARVORs #107, #108, #109 and #110 flew due west for 6 months without relative dispersion), since it flew southwestward during its cycles #1, #2 and #3. However, after 1.5 year, the overall motion is westward.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m106-c1.raw	m106-c1.fin	m106-c1.diaric
m106-c2.raw	m106-c2.fin	m106-c2.diaric
m106-c3.raw	m106-c3.fin	m106-c3.diaric
m106-c4.raw	m106-c4.fin	m106-c4.diaric
m106-c5.raw	m106-c5.fin	m106-c5.diaric
m106-c6.raw	m106-c6.fin	m106-c6.diaric
m106-c7.raw	m106-c7.fin	m106-c7.diaric
m106-c8.raw	m106-c8.fin	m106-c8.diaric
m106-c9.raw	m106-c9.fin	m106-c9.diaric

SAMBA M106 CYCLES 1 TO 9





SAMBA M106 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m106

launch date	launch lat	launch long
1994 2 19 13h UT	22.683 S	32.967 W

file	m106-c1.fin	m106-c2.fin	m106-c3.fin
date of 1st pos	1994 2 20 (16122)	1994 4 23 (16184)	1994 6 24 (16246)
1st pos	32.992W 22.675S	34.619W 23.805S	34.544W 23.767S
last pos	34.481W 23.583S	34.480W 23.616S	35.507W 25.186S
1st P and T	803dbar 4.52degC	798dbar 4.86degC	800dbar 4.63degC
last P and T	826dbar 4.65degC	809dbar 4.49degC	807dbar 5.12degC
displacements (East and North)	-152km -101km	14km 21km	-97km -158km
mean velocities (East and North)	-2.98cm/s -1.98cm/s	0.28cm/s 0.41cm/s	-1.91cm/s -3.09cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.55 cm/s [-2.75, -0.34]
average north velocity comp.= -1.55 cm/s [-2.63, -0.48]

variances
variance of east velocity comp.= 5.92 cm2/s2 [2.05, 9.78]
variance of north velocity comp.= 4.71 cm2/s2 [1.63, 7.78]

covariance
covariance= 2.35 cm2/s2 [-0.09, 4.79]

Eddy Kinetic Energy
EKE= 5.31 cm2/s2 [2.84, 7.78]

Temperature time series statistics:

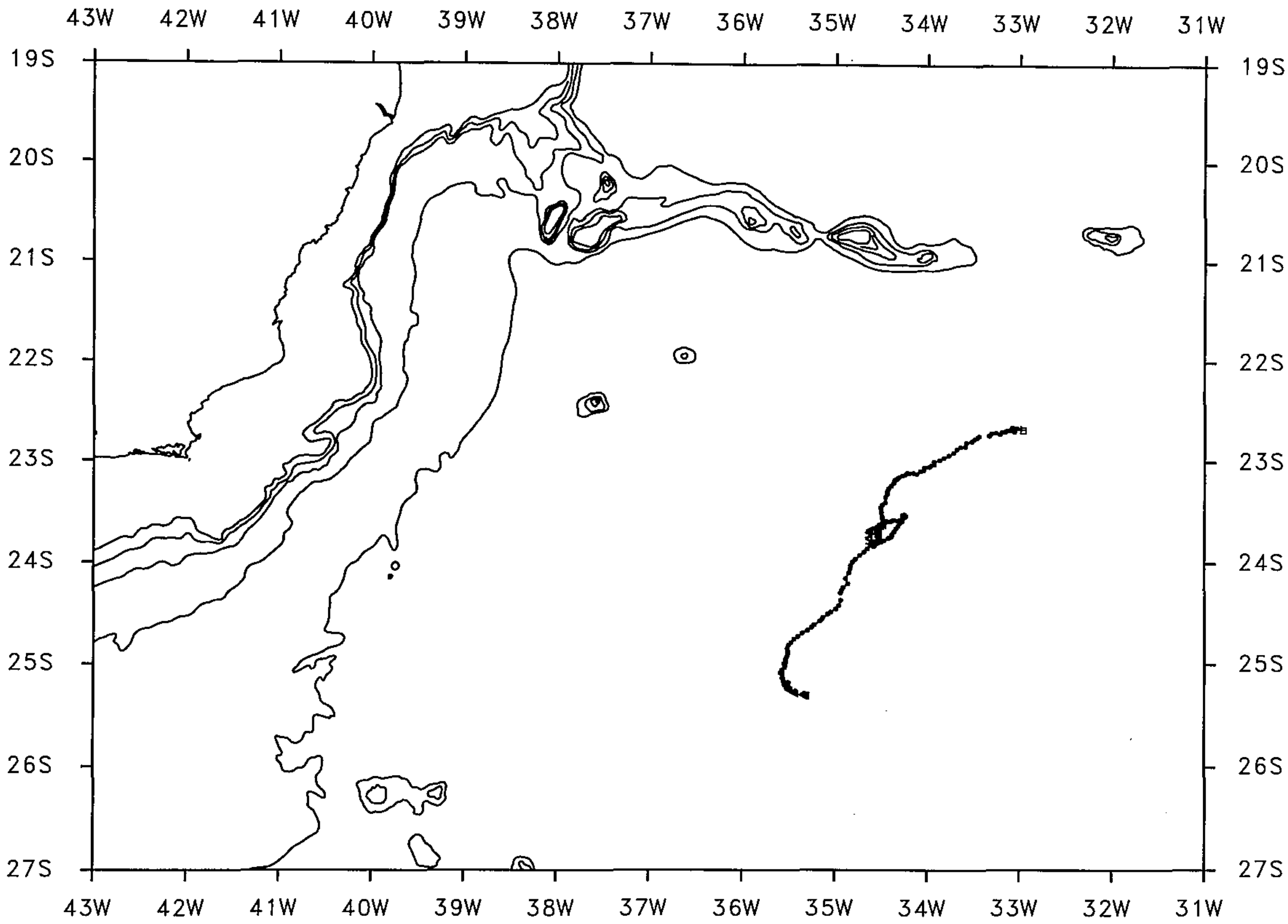
sampling interval= 24 h
number of samples= 170

average temperature= 4.74 degC

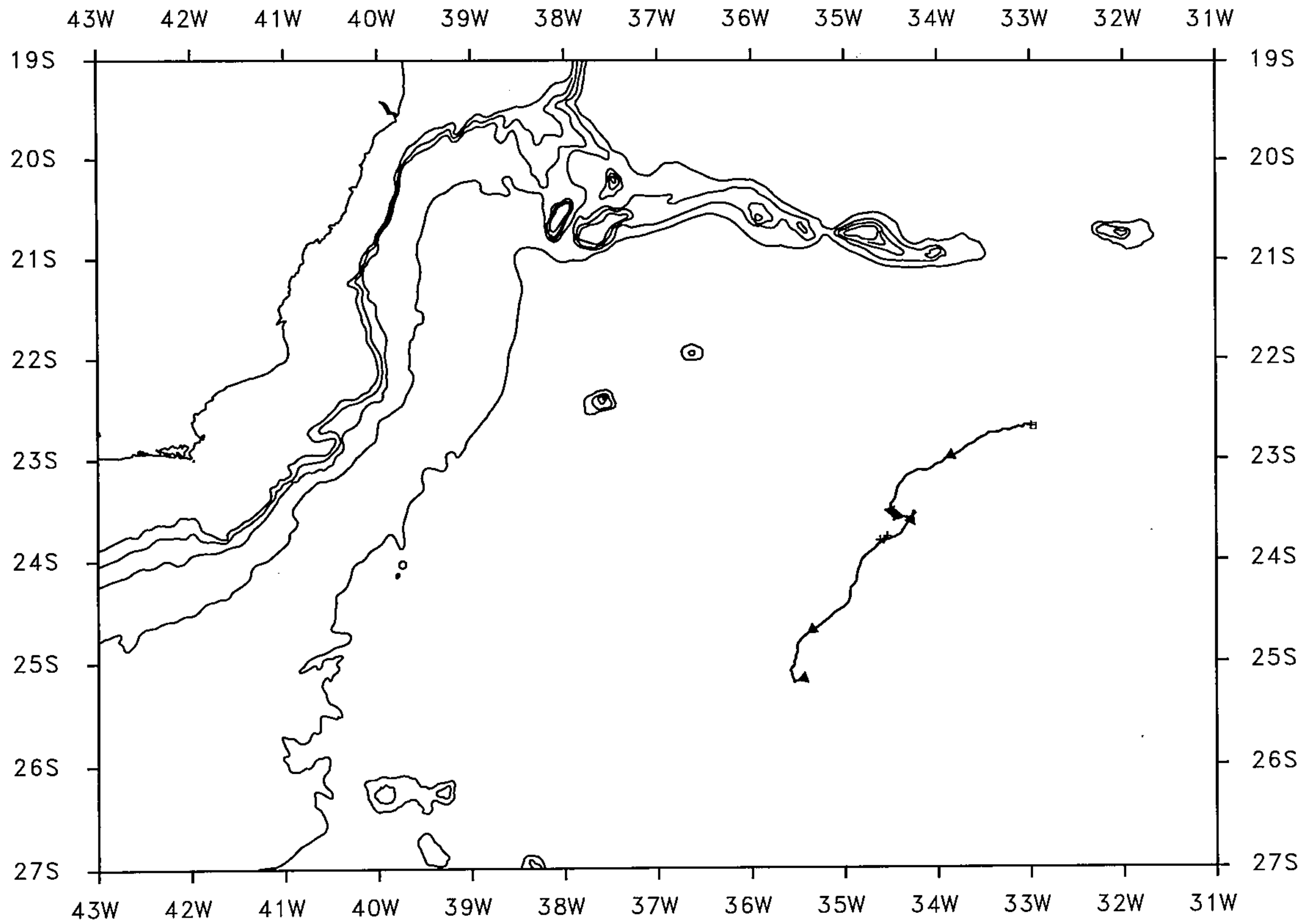
temperature variance= 0.0335 degC*degC

covar(u,temp)= 0.21 cm.degC/s
covar(v,temp)= 0.05 cm.degC/s

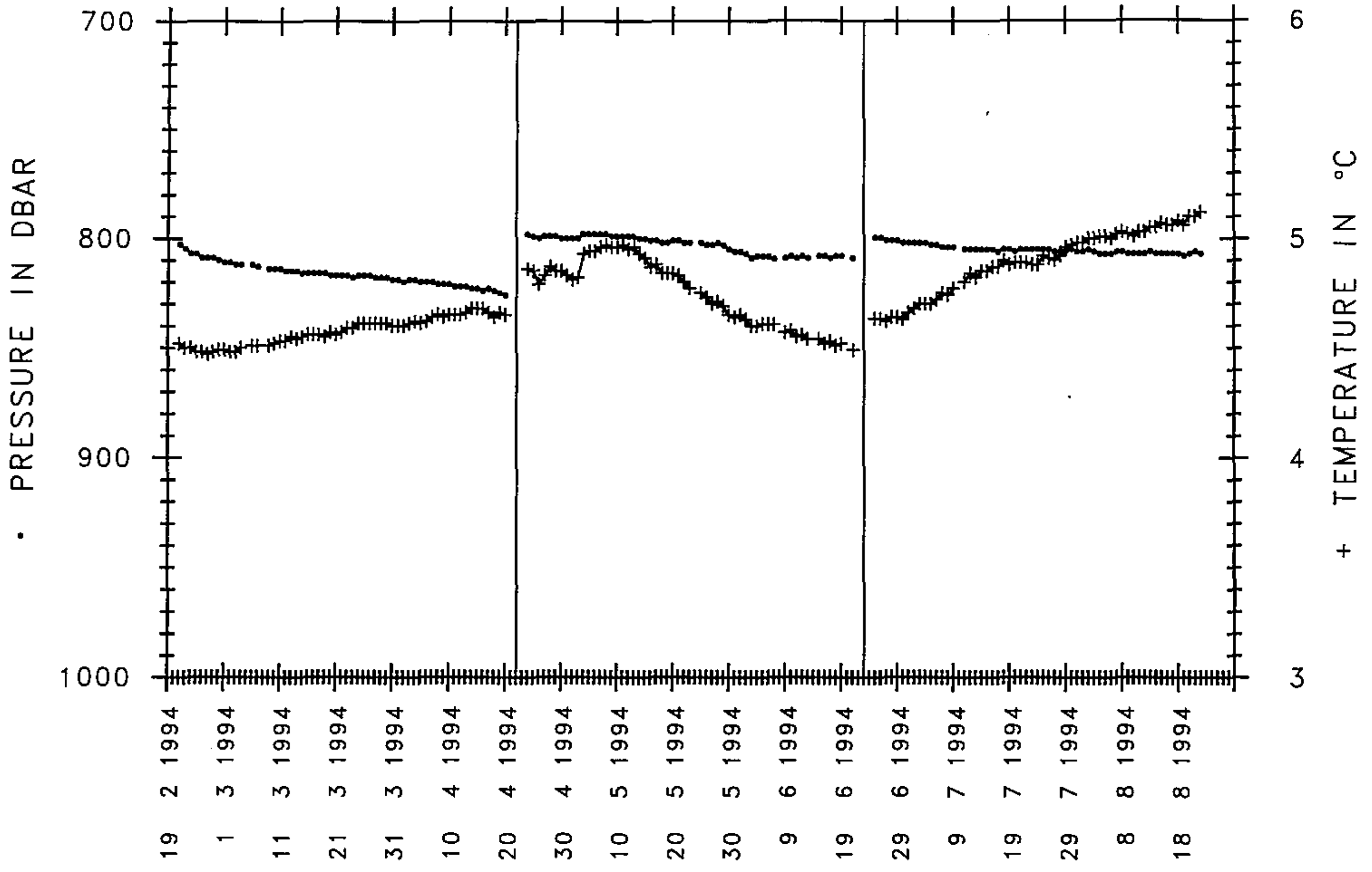
Comments:

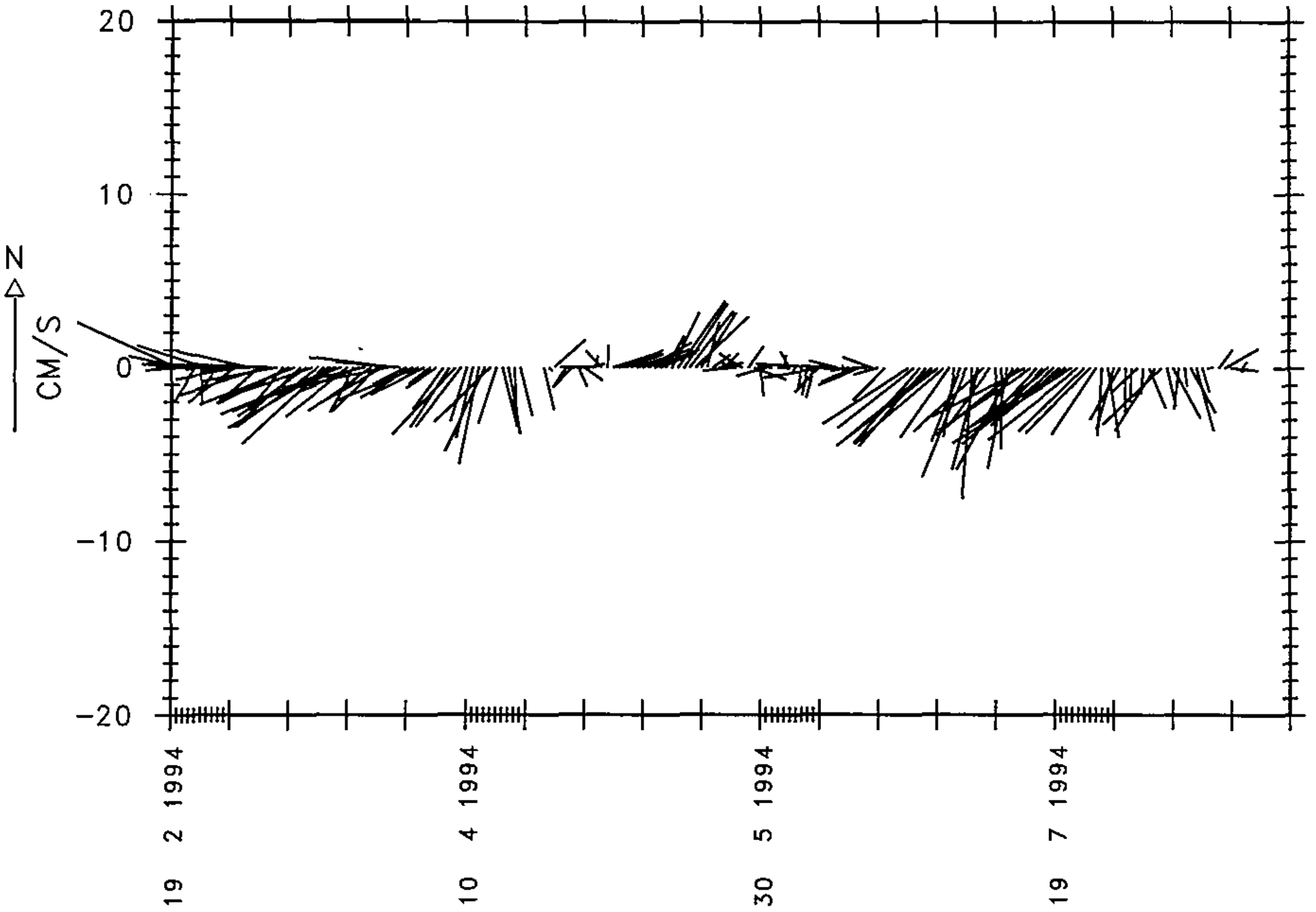


SAMBA M106 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M106 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED





SAMBA M106 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m106

launch date	launch lat	launch long
1994 2 19 13h UT	22.683 S	32.967 W

file	m106-c4.fin	m106-c5.fin	m106-c6.fin
date of 1st pos	1994 8 25 (16308)	1994 10 26 (16370)	1994 12 27 (16432)
1st pos	35.222W 25.267S	35.714W 24.207S	34.573W 25.074S
last pos	36.008W 24.080S	35.146W 24.881S	35.517W 25.198S
1st P and T	787dbar 5.22degC	795dbar 4.60degC	785dbar 4.88degC
last P and T	812dbar 4.68degC	814dbar 4.70degC	814dbar 4.66degC
displacements (East and North)	-79km 132km	57km -75km	-95km -14km
mean velocities (East and North)	-1.56cm/s 2.59cm/s	1.13cm/s -1.47cm/s	-1.86cm/s -0.27cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.77 cm/s [-1.84, 0.31]
average north velocity comp.= 0.28 cm/s [-0.81, 1.37]

variances
variance of east velocity comp.= 4.72 cm2/s2 [1.64, 7.80]
variance of north velocity comp.= 4.84 cm2/s2 [1.68, 8.00]

covariance
covariance= -2.45 cm2/s2 [-4.66, -0.24]

Eddy Kinetic Energy
EKE= 4.78 cm2/s2 [2.57, 6.99]

Temperature time series statistics:

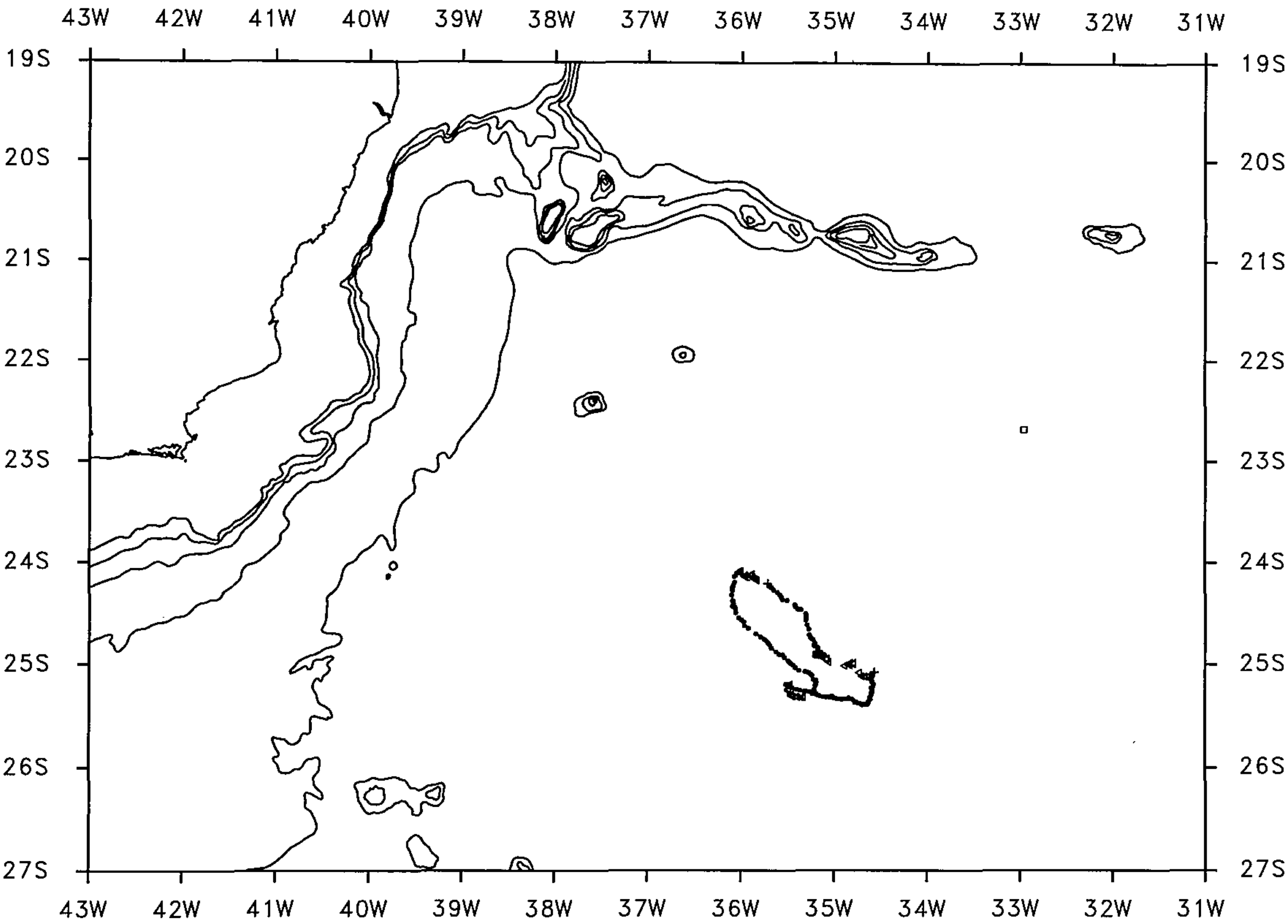
sampling interval= 24 h
number of samples= 165

average temperature= 4.81 degC

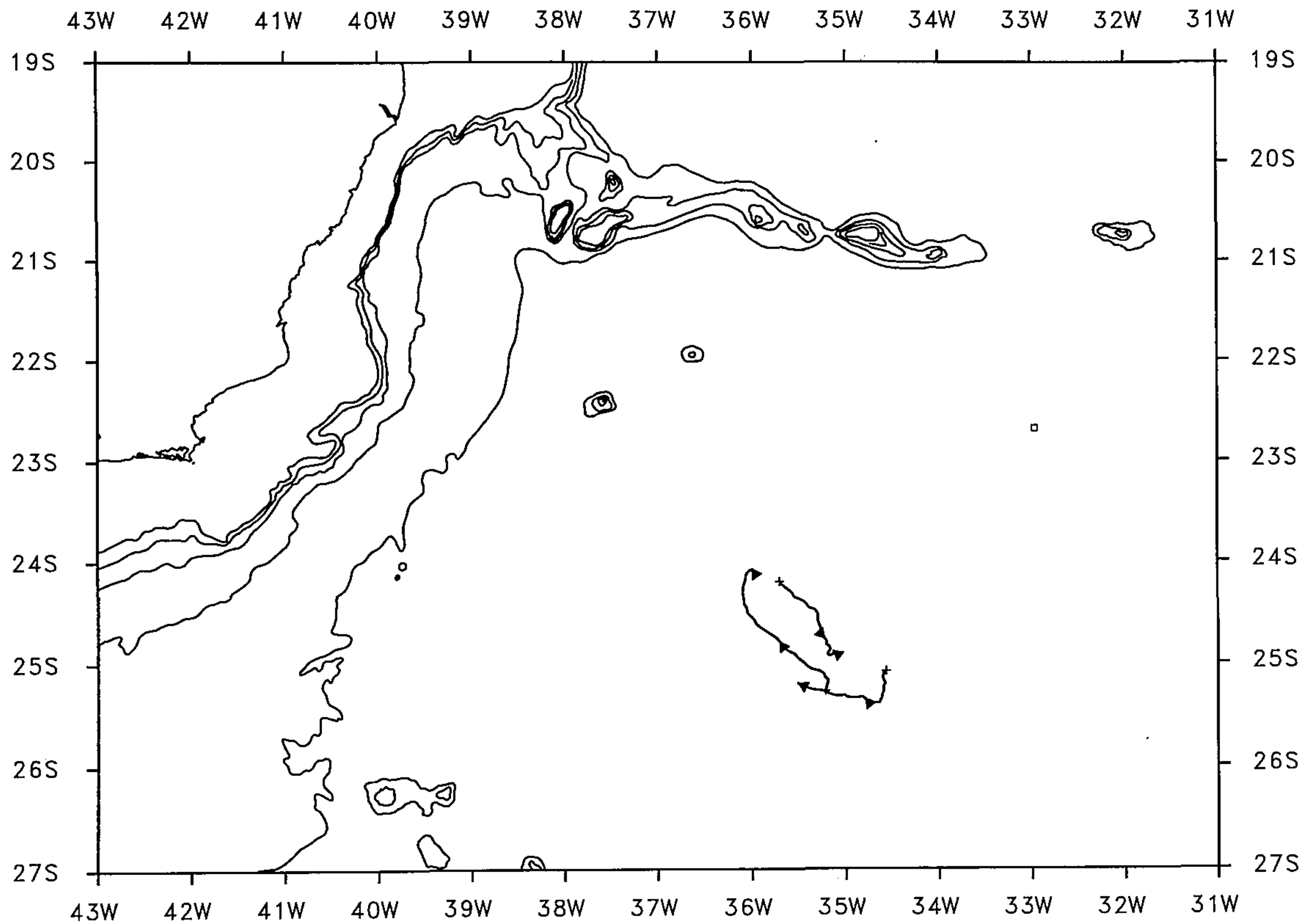
temperature variance= 0.0346 degC*degC

covar(u,temp)= -0.12 cm.degC/s
covar(v,temp)= 0.20 cm.degC/s

Comments:

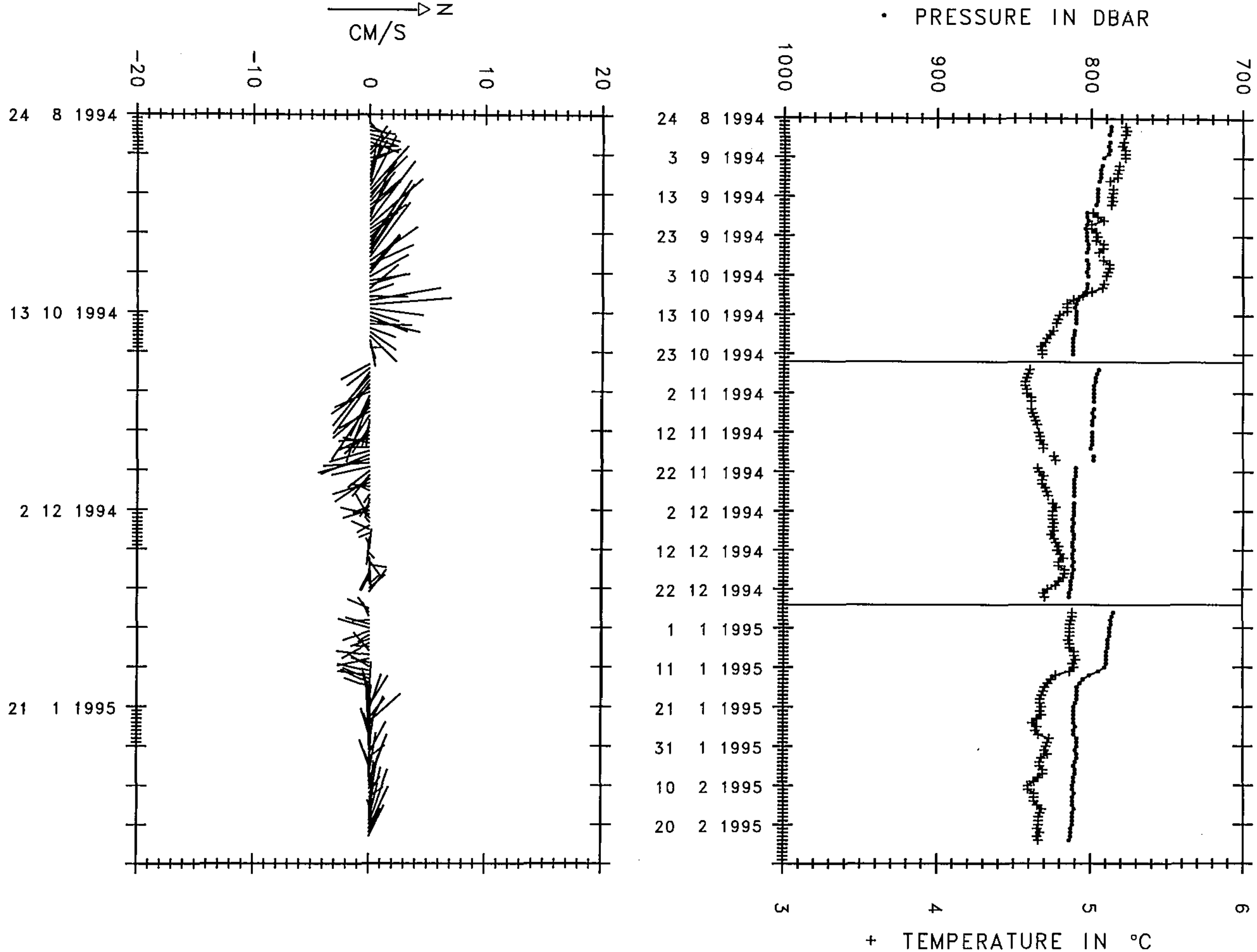


SAMBA M106 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M106 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED

SAMBA M106 CYCLES 4,5 AND 6



EXPERIMENT: SAMBA

FLOAT: m106

launch date	launch lat	launch long
1994 2 19 13h UT	22.683 S	32.967 W

file	m106-c7.fin	m106-c8.fin	m106-c9.fin
date of 1st pos	1995 2 27 (16494)	1995 4 30 (16556)	1995 7 1 (16618)
1st pos	35.319W 25.325S	36.425W 24.306S	36.829W 23.021S
last pos	36.200W 24.507S	36.155W 22.764S	38.519W 23.379S
1st P and T	802dbar 4.66degC	790dbar 4.82degC	796dbar 5.29degC
last P and T	852dbar 4.24degC	821dbar 4.80degC	834dbar 4.81degC
displacements (East and North)	-89km 91km	28km 171km	-173km -40km
mean velocities (East and North)	-1.74cm/s 1.78cm/s	0.54cm/s 3.36cm/s	-3.39cm/s -0.78cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.54 cm/s [-3.35, 0.27]
average north velocity comp.= 1.46 cm/s [-0.23, 3.15]

variances
variance of east velocity comp.= 13.31 cm2/s2 [4.61, 22.00]
variance of north velocity comp.= 11.66 cm2/s2 [4.04, 19.28]

covariance
covariance= 0.75 cm2/s2 [-5.01, 6.50]

Eddy Kinetic Energy
EKE= 12.48 cm2/s2 [6.70, 18.27]

Temperature time series statistics:

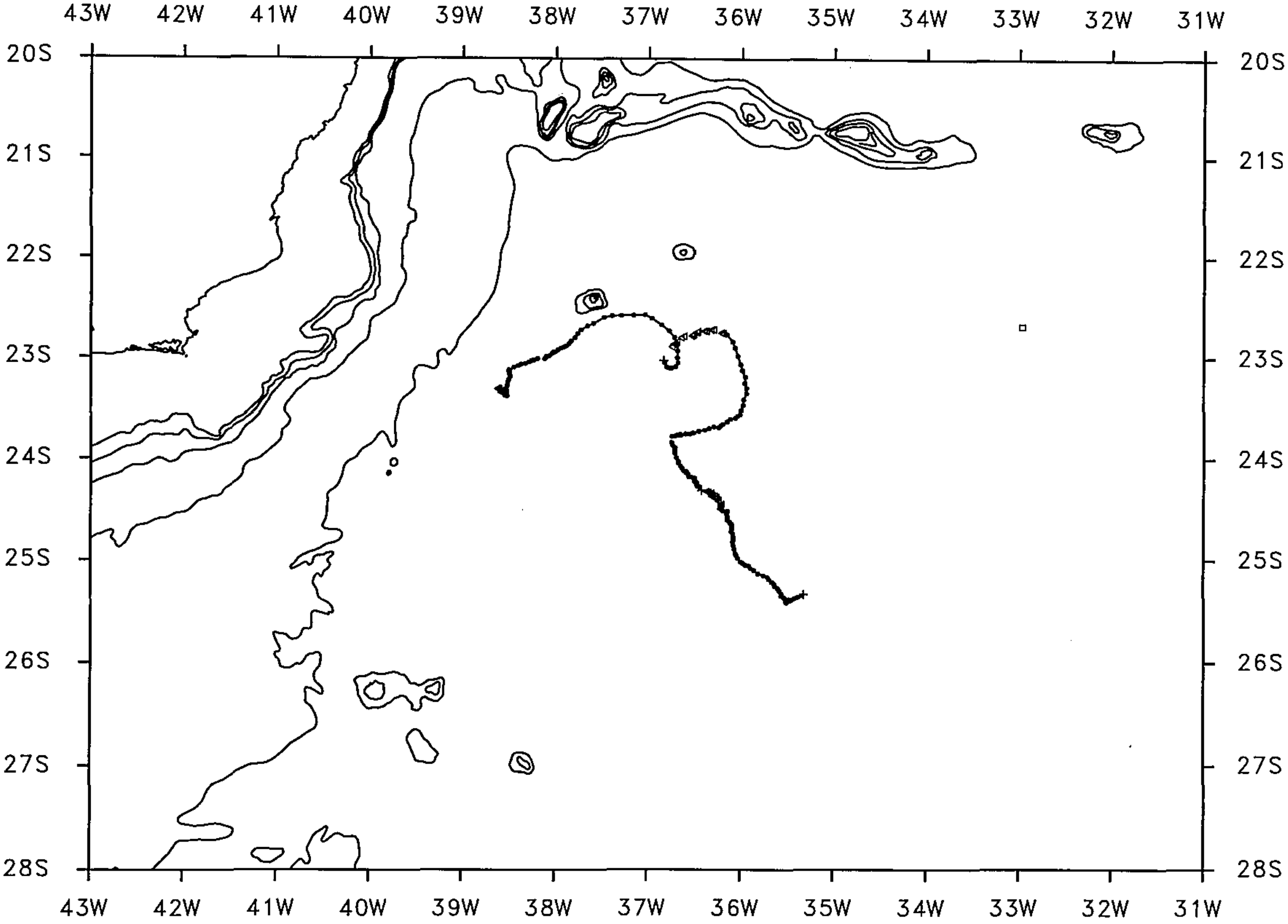
sampling interval= 24 h
number of samples= 177

average temperature= 4.67 degC

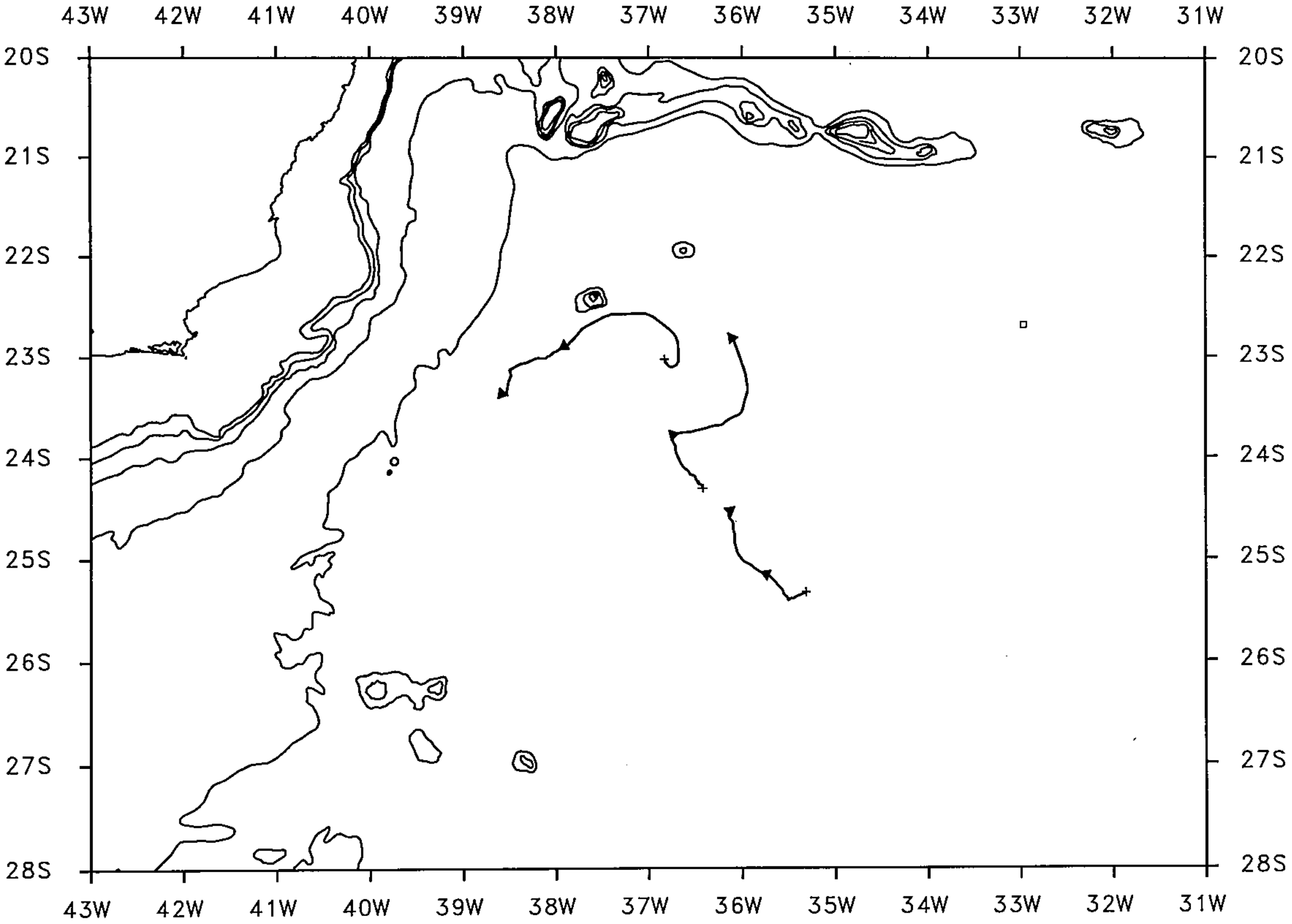
temperature variance= 0.0552 degC*degC

covar(u,temp)= -0.32 cm.degC/s
covar(v,temp)= -0.05 cm.degC/s

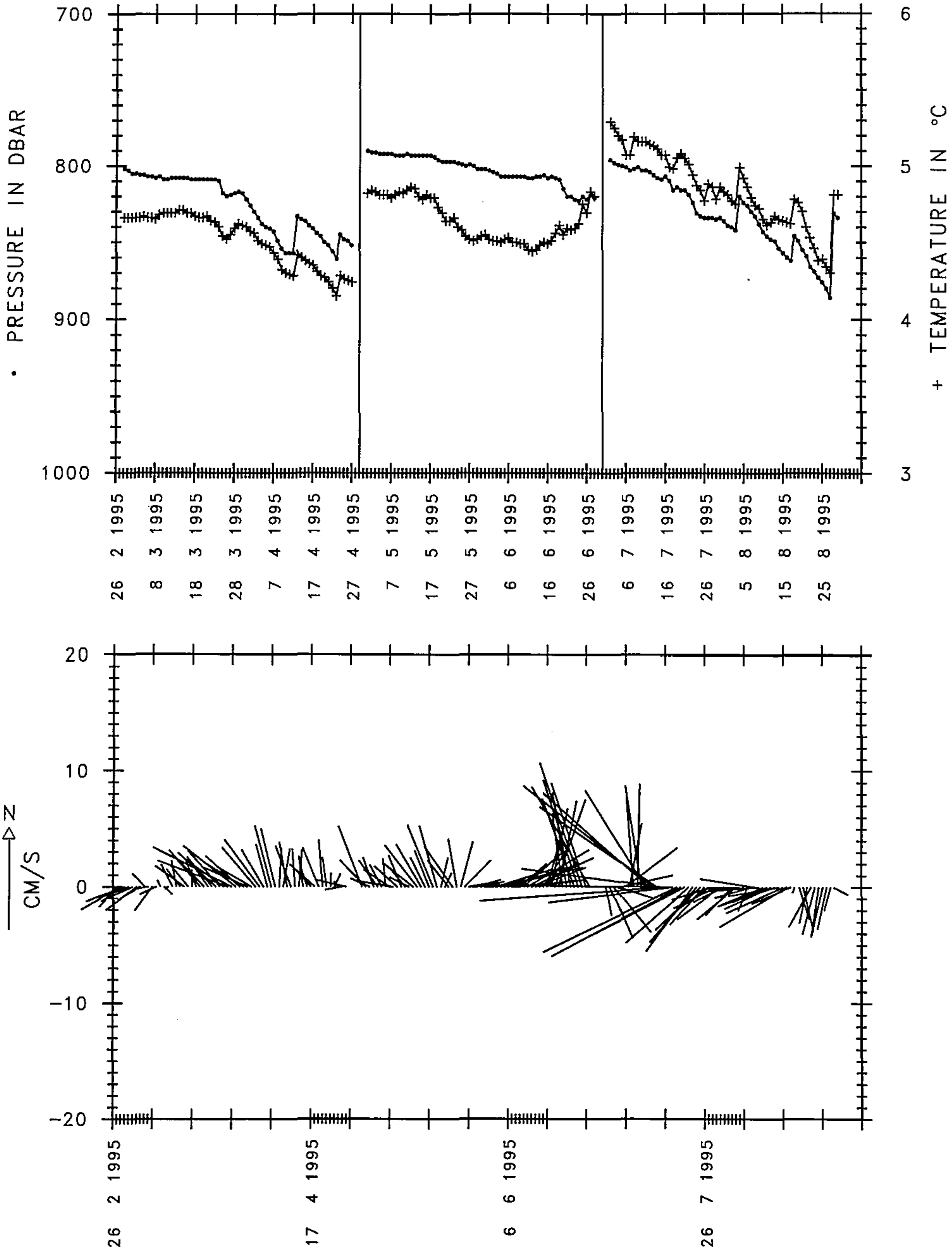
Comments:



SAMBA M106 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M106 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M106 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #107

LAUNCHED AT: 22°22.5'S 33°02.0'W on 19/02/1994 15h01 UT

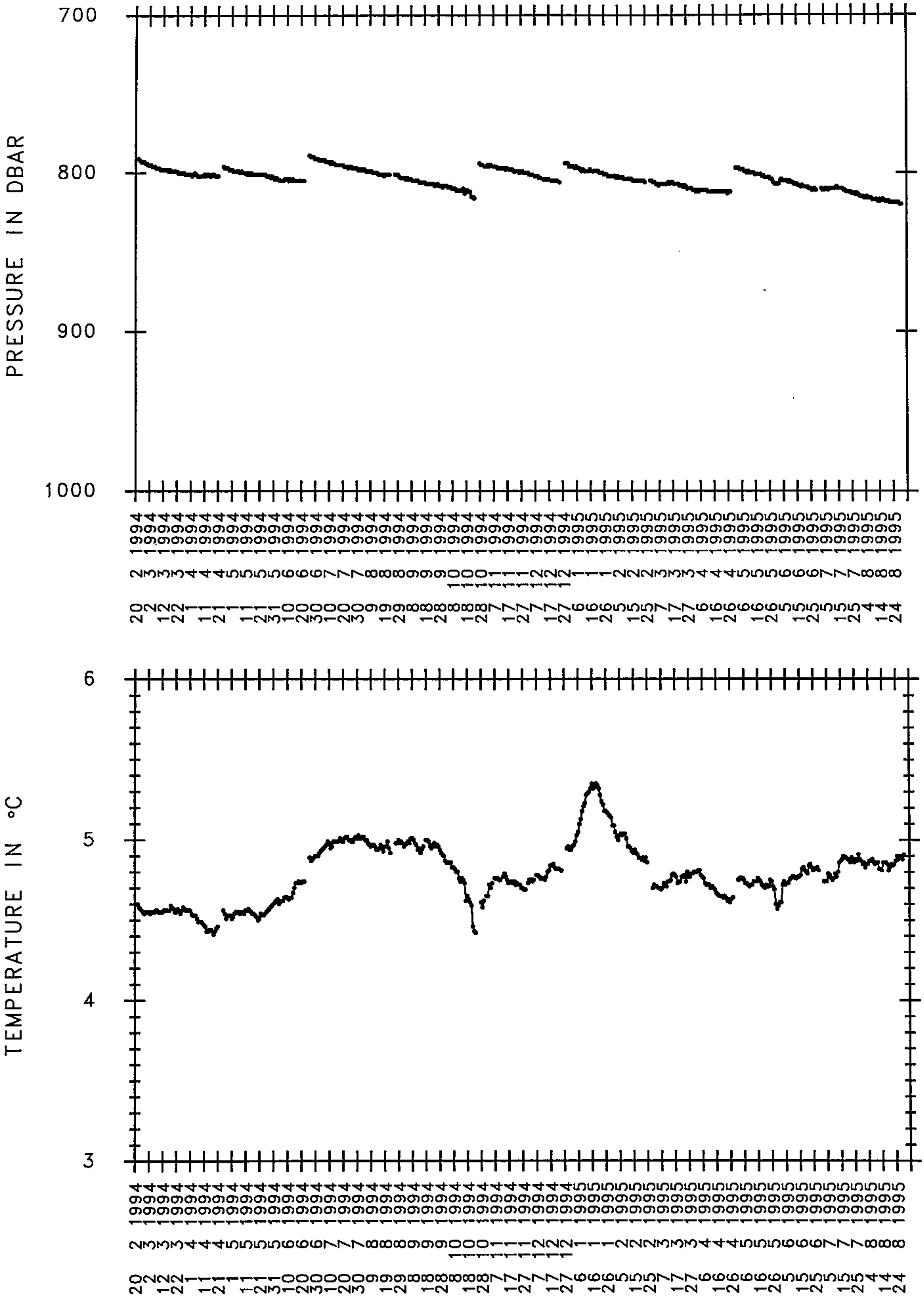
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

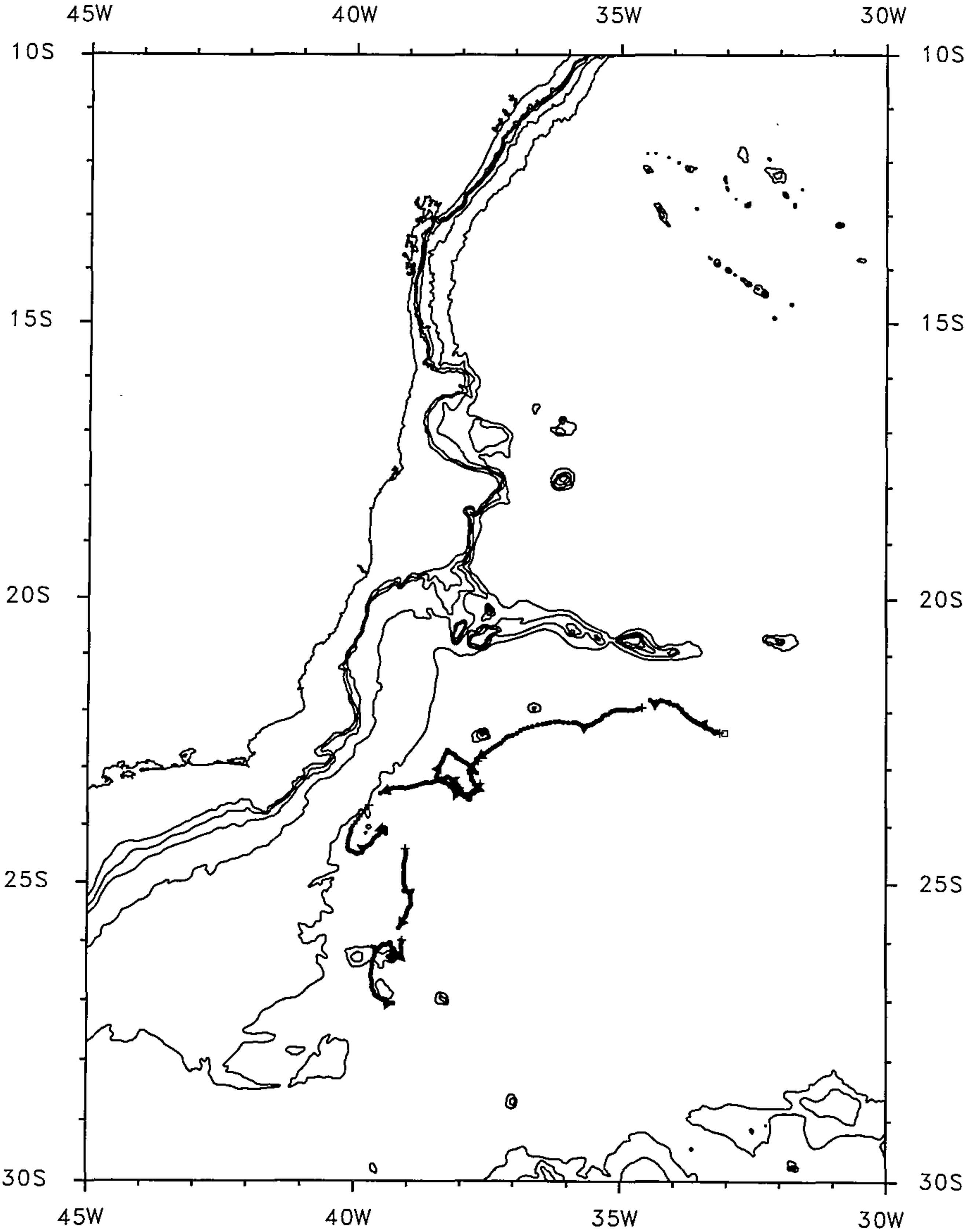
This float shows a regular westward flow for 4 months, then a general southward but sluggish motion. There are a few topographic influences apparent.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m107-c1.raw	m107-c1.fin	m107-c1.diaric
m107-c2.raw	m107-c2.fin	m107-c2.diaric
m107-c3.raw	m107-c3.fin	m107-c3.diaric
m107-c4.raw	m107-c4.fin	m107-c4.diaric
m107-c5.raw	m107-c5.fin	m107-c5.diaric
m107-c6.raw	m107-c6.fin	m107-c6.diaric
m107-c7.raw	m107-c7.fin	m107-c7.diaric
m107-c8.raw	m107-c8.fin	m107-c8.diaric
m107-c9.raw	m107-c9.fin	m107-c9.diaric



SAMBA M107 CYCLES 1 TO 9



SAMBA M107 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m107

launch date	launch lat	launch long
1994 2 19 15h UT	22.375 S	33.033 W

file	m107-c1.fin	m107-c2.fin	m107-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 24 (16185)	1994 6 25 (16247)
1st pos	33.125W 22.364S	34.593W 21.932S	37.673W 22.883S
last pos	34.443W 21.794S	37.710W 22.857S	38.142W 23.370S
1st P and T	791dbar 4.60degC	796dbar 4.56degC	789dbar 4.89degC
last P and T	802dbar 4.46degC	805dbar 4.74degC	801dbar 4.92degC
displacements (East and North)	-136km 63km	-320km -103km	-48km -54km
mean velocities (East and North)	-2.71cm/s 1.26cm/s	-6.28cm/s -2.02cm/s	-0.94cm/s -1.06cm/s
number of pos	59	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 179

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.34 cm/s [-4.86, -1.81]
average north velocity comp.= -0.59 cm/s [-1.80, 0.61]

variances
variance of east velocity comp.= 9.50 cm2/s2 [3.29, 15.70]
variance of north velocity comp.= 5.92 cm2/s2 [2.05, 9.78]

covariance
covariance= 0.91 cm2/s2 [-2.56, 4.37]

Eddy Kinetic Energy
EKE= 7.71 cm2/s2 [4.05, 11.36]

Temperature time series statistics:

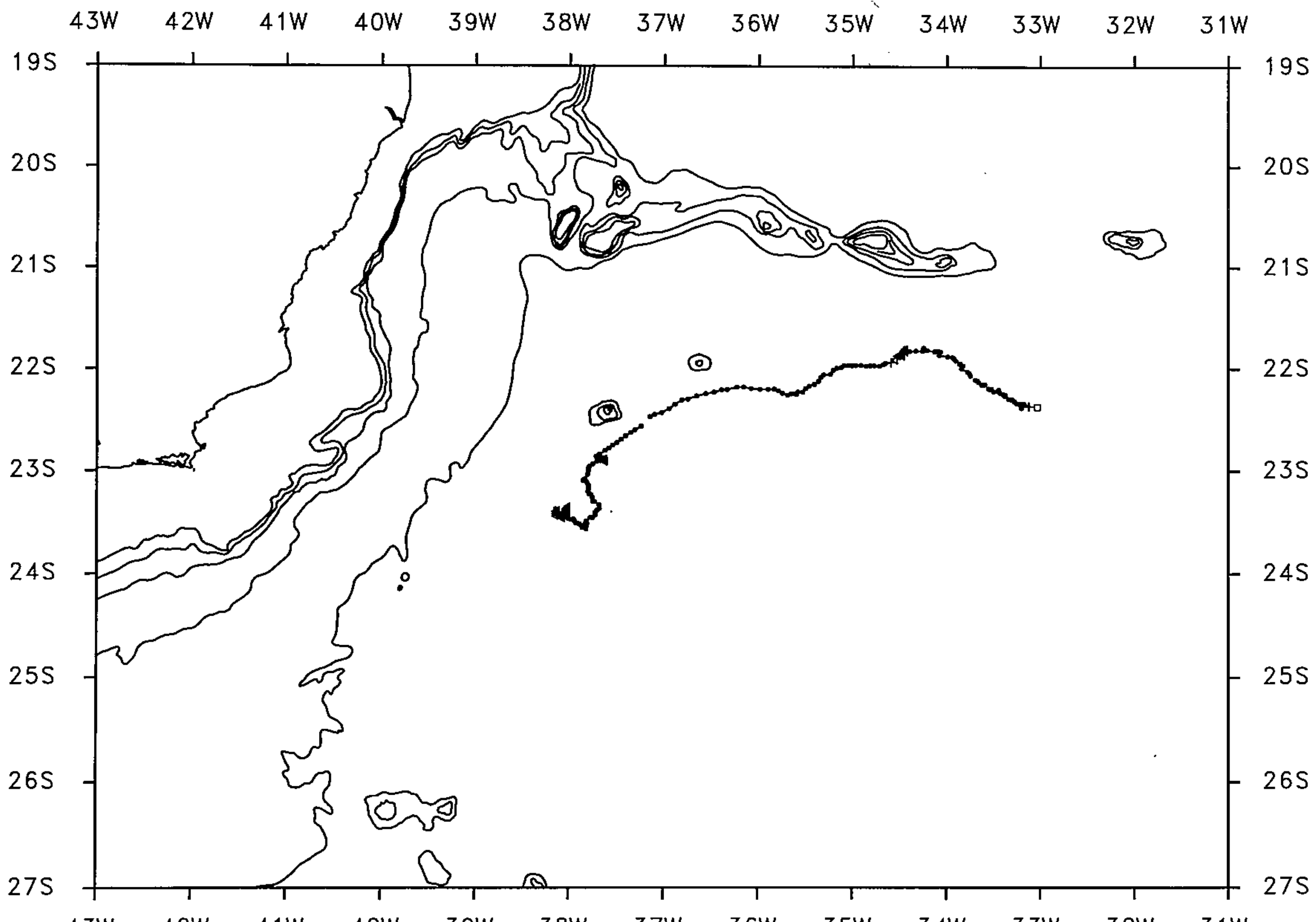
sampling interval= 24 h
number of samples= 176

average temperature= 4.69 degC

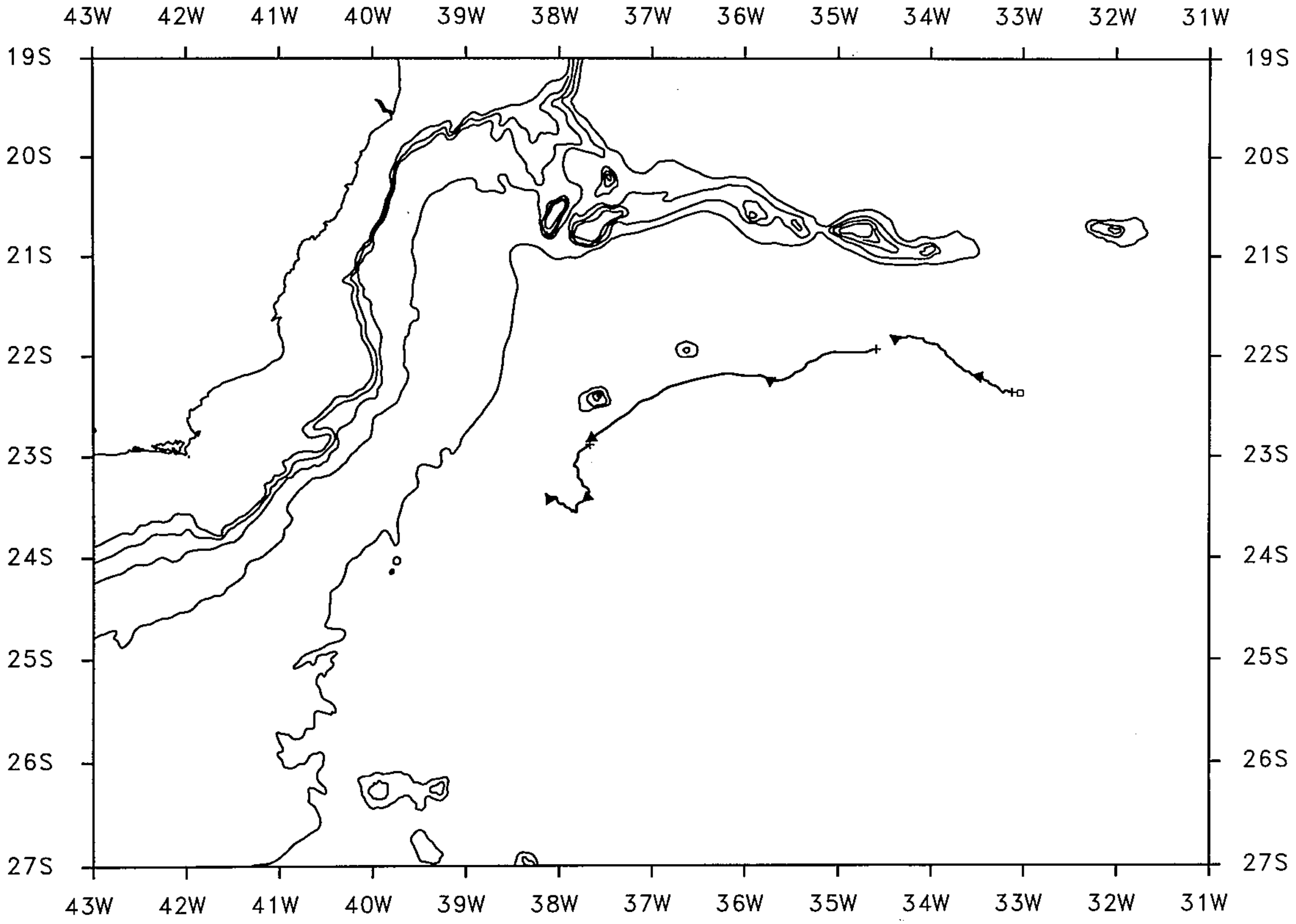
temperature variance= 0.0406 degC*degC

covar(u,temp)= 0.30 cm.degC/s
covar(v,temp)= -0.12 cm.degC/s

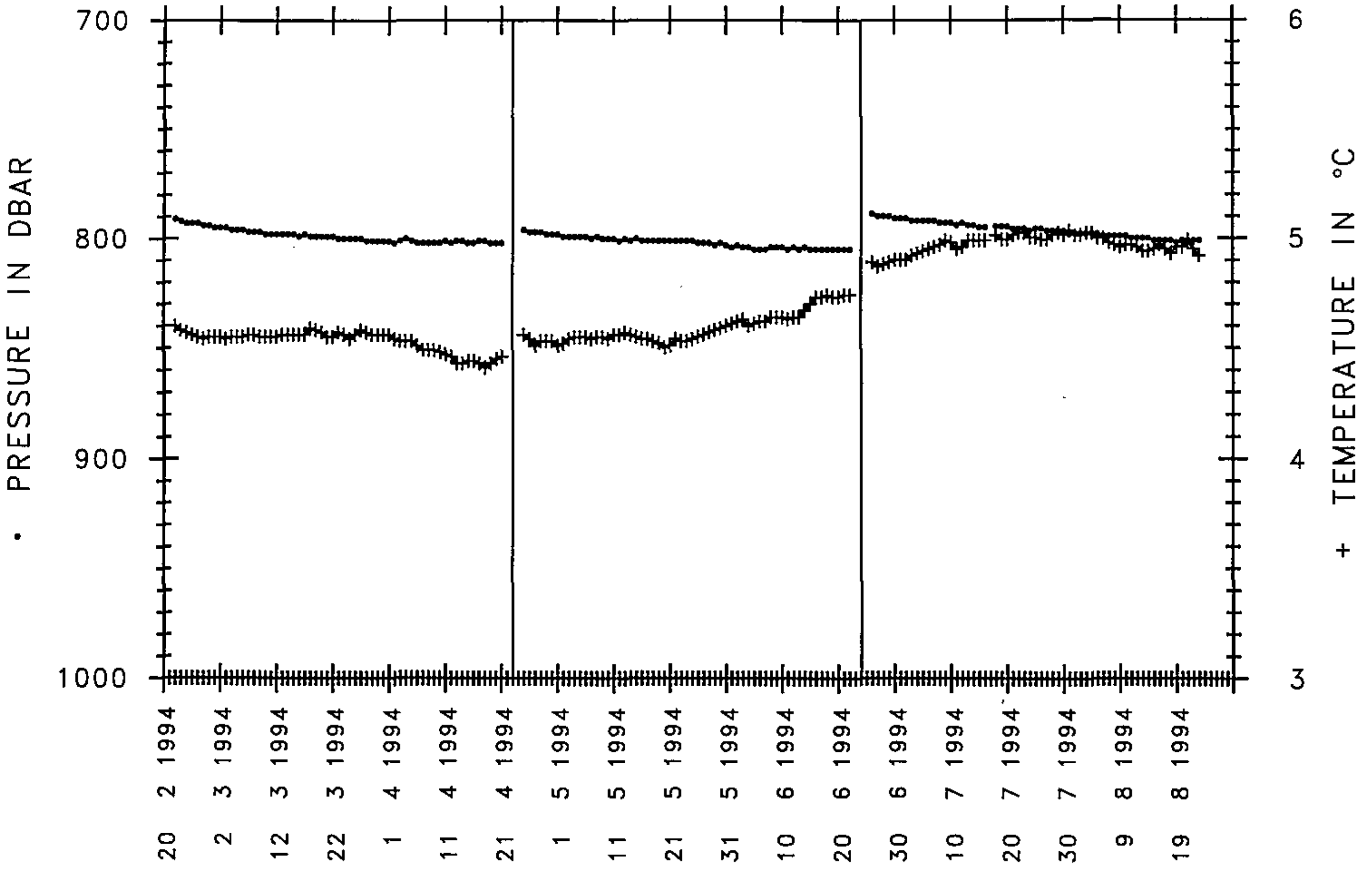
Comments:

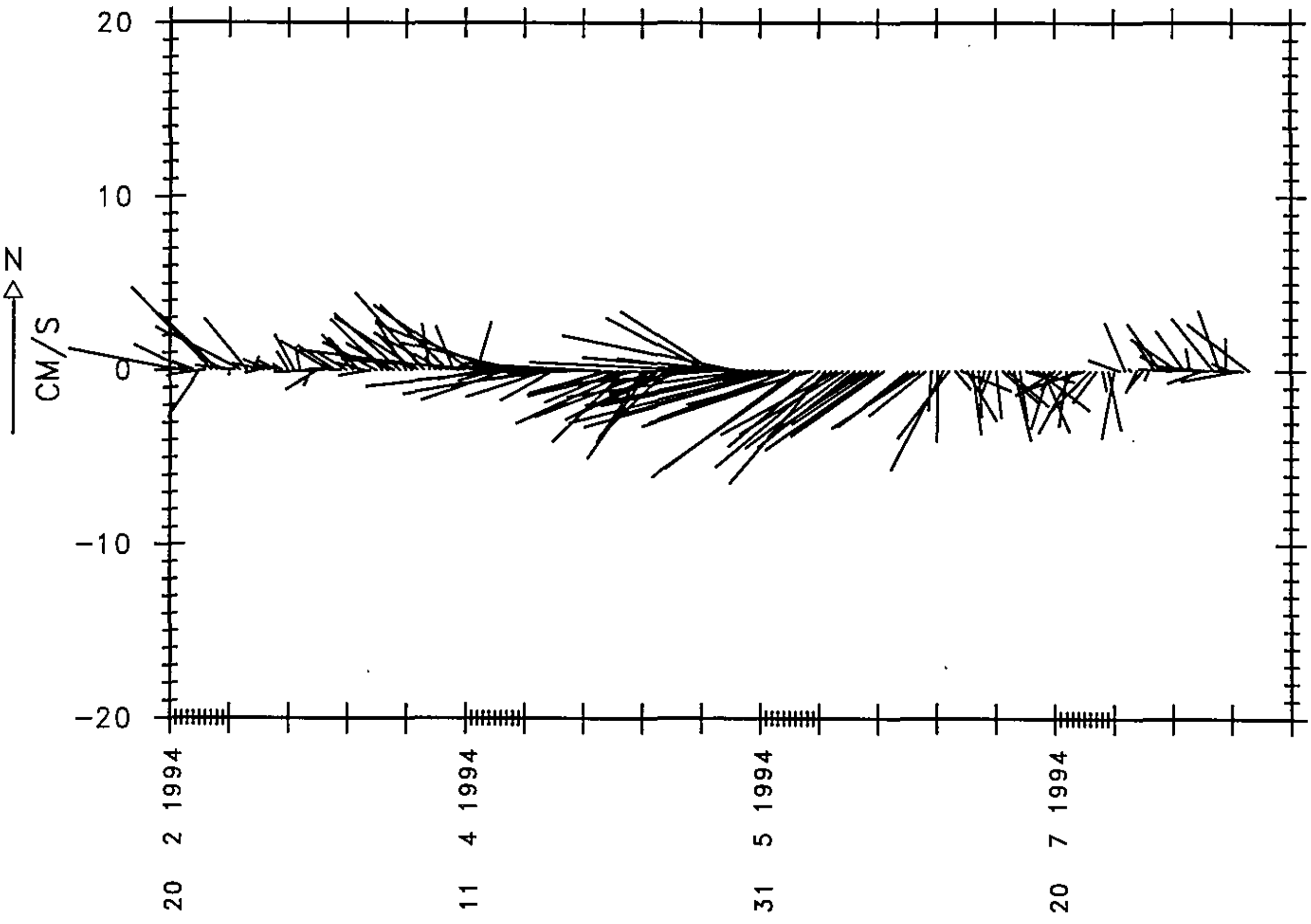


SAMBA M107 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M107 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED





SAMBA M107 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m107

launch date	launch lat	launch long
1994 2 19 15h UT	22.375 S	33.033 W

file	m107-c4.fin	m107-c5.fin	m107-c6.fin
date of 1st pos	1994 8 26 (16309)	1994 10 27 (16371)	1994 12 28 (16433)
1st pos	38.016W 23.353S	37.626W 23.279S	39.720W 23.661S
last pos	37.696W 23.099S	39.510W 23.446S	39.420W 24.150S
1st P and T	801dbar 4.98degC	794dbar 4.61degC	794dbar 4.95degC
last P and T	816dbar 4.42degC	806dbar 4.81degC	806dbar 4.86degC
displacements (East and North)	33km 28km	-192km -19km	30km -54km
mean velocities (East and North)	0.64cm/s 0.55cm/s	-3.77cm/s -0.36cm/s	0.60cm/s -1.07cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.86 cm/s [-2.54, 0.82]
average north velocity comp.= -0.33 cm/s [-1.85, 1.19]

variances
variance of east velocity comp.= 11.55 cm2/s2 [4.00, 19.10]
variance of north velocity comp.= 9.45 cm2/s2 [3.28, 15.63]

covariance
covariance= 2.61 cm2/s2 [-2.21, 7.44]

Eddy Kinetic Energy
EKE= 10.50 cm2/s2 [5.63, 15.38]

Temperature time series statistics:

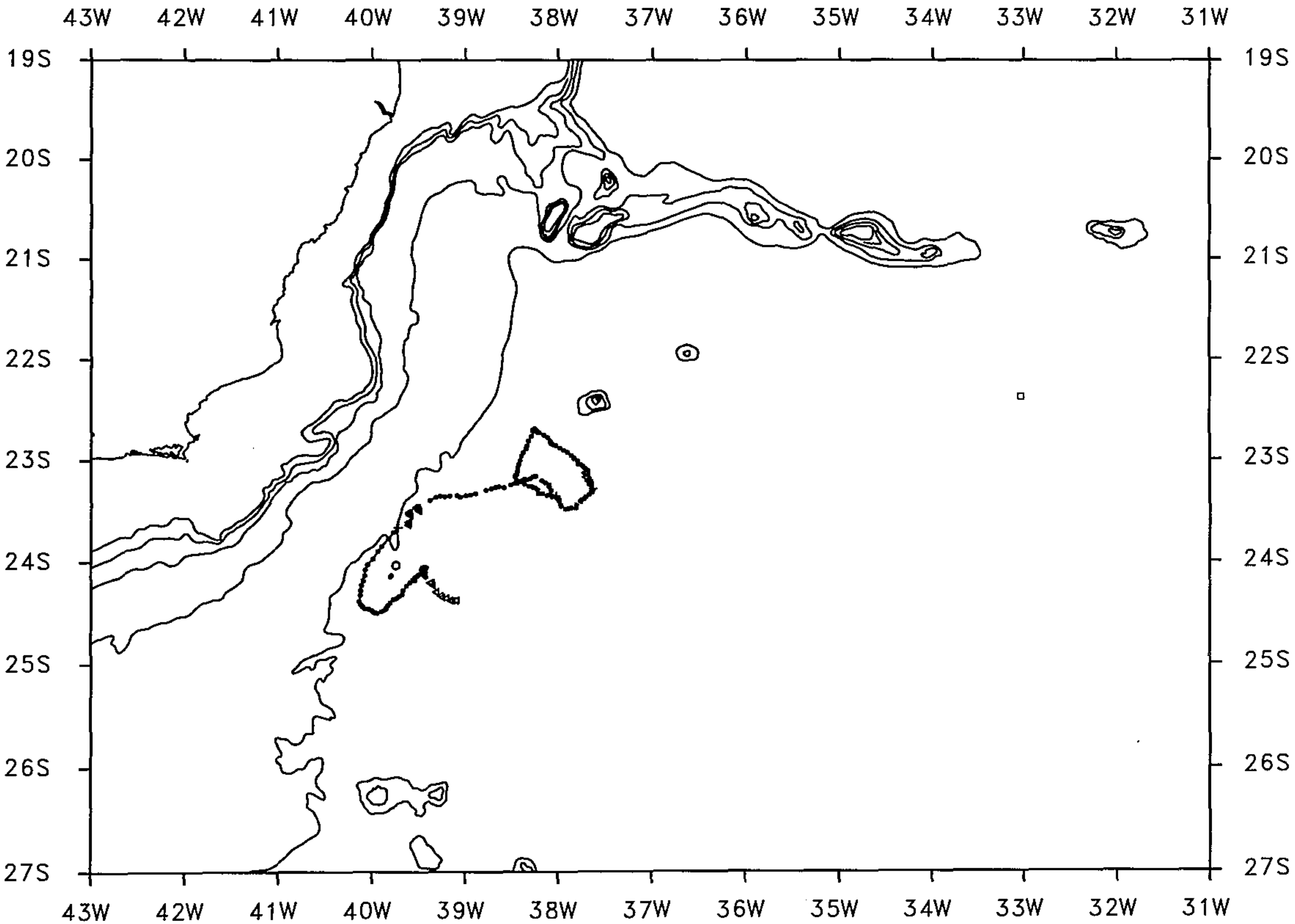
sampling interval= 24 h
number of samples= 166

average temperature= 4.91 degC

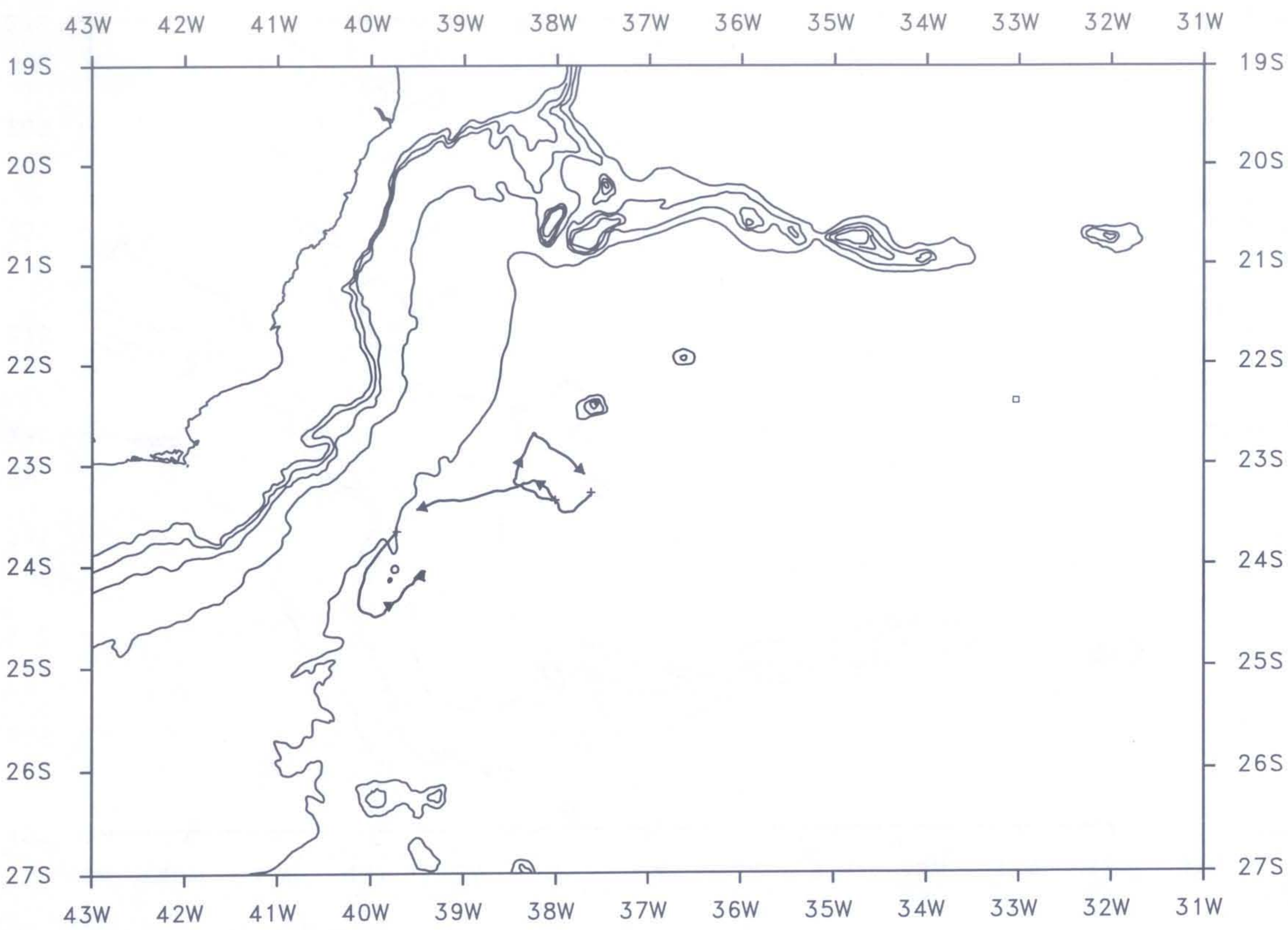
temperature variance= 0.0360 degC*degC

covar(u,temp)= 0.20 cm.degC/s
covar(v,temp)= 0.11 cm.degC/s

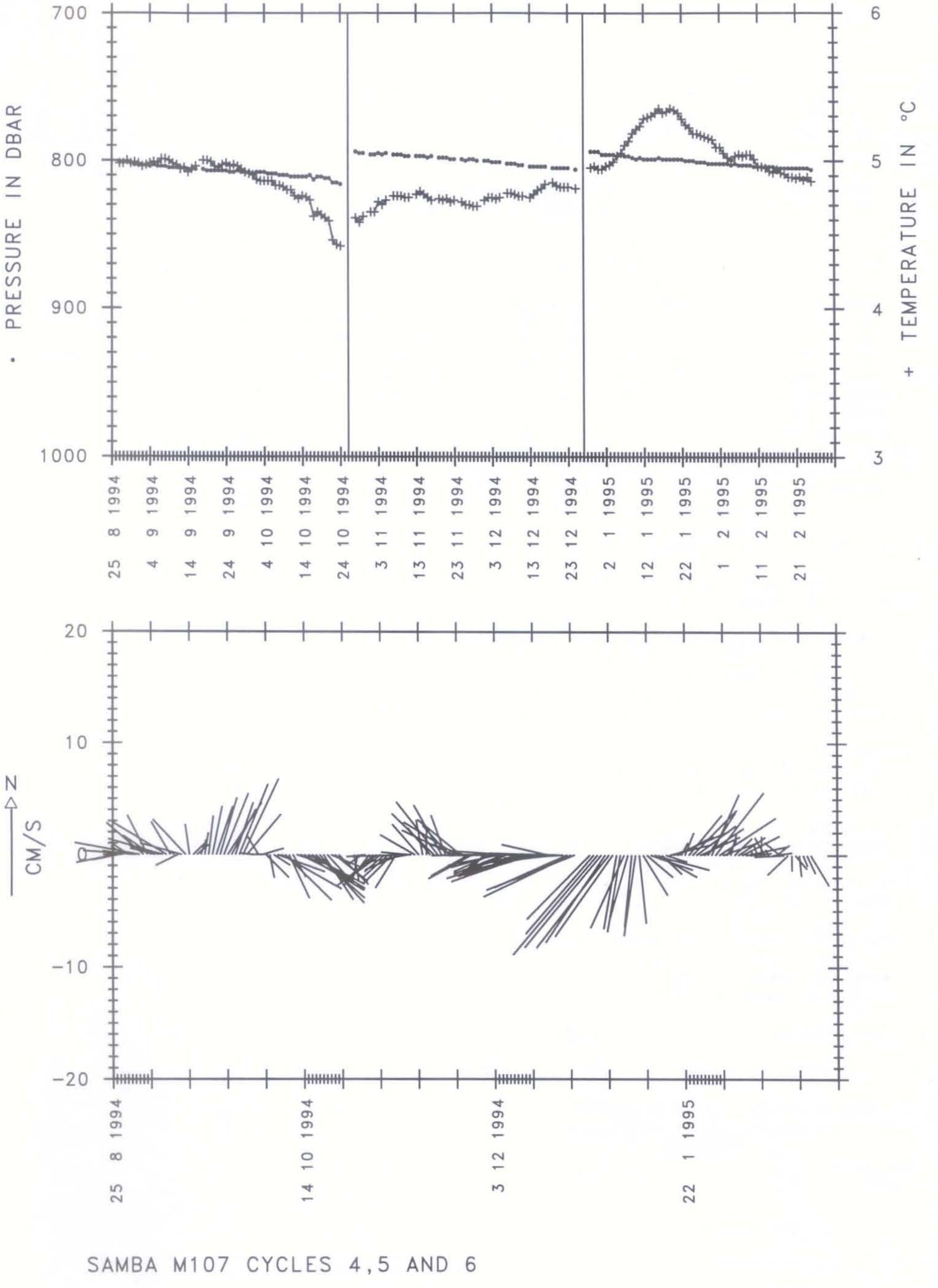
Comments:



SAMBA M107 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M107 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M107 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m107

launch date	launch lat	launch long
1994 2 19 15h UT	22.375 S	33.033 W

file	m107-c7.fin	m107-c8.fin	m107-c9.fin
date of 1st pos	1995 2 28 (16495)	1995 5 1 (16557)	1995 7 2 (16619)
1st pos	39.050W 24.406S	39.098W 25.981S	39.272W 26.157S
last pos	39.163W 25.769S	39.269W 26.124S	39.249W 27.053S
1st P and T	805dbar 4.70degC	797dbar 4.75degC	810dbar 4.74degC
last P and T	812dbar 4.64degC	811dbar 4.81degC	820dbar 4.91degC
displacements (East and North)	-11km -151km	-17km -16km	2km -100km
mean velocities (East and North)	-0.22cm/s -2.97cm/s	-0.33cm/s -0.31cm/s	0.04cm/s -1.95cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.16 cm/s [-1.00, 0.68]
average north velocity comp.= -1.72 cm/s [-2.88, -0.56]

variances
variance of east velocity comp.= 2.89 cm2/s2 [1.00, 4.78]
variance of north velocity comp.= 5.45 cm2/s2 [1.89, 9.01]

covariance
covariance= 0.14 cm2/s2 [-1.70, 1.97]

Eddy Kinetic Energy
EKE= 4.17 cm2/s2 [2.16, 6.19]

Temperature time series statistics:

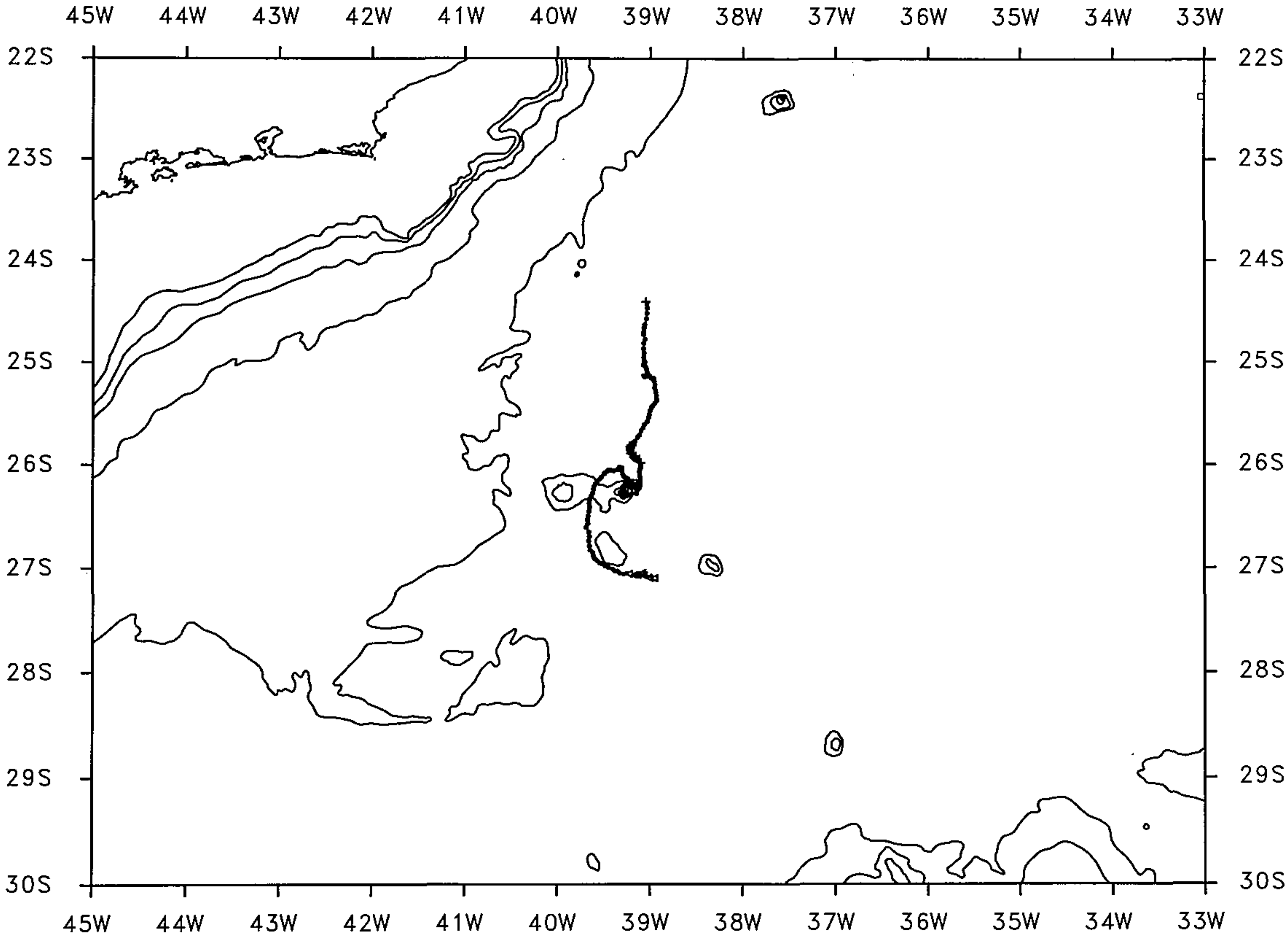
sampling interval= 24 h
number of samples= 177

average temperature= 4.77 degC

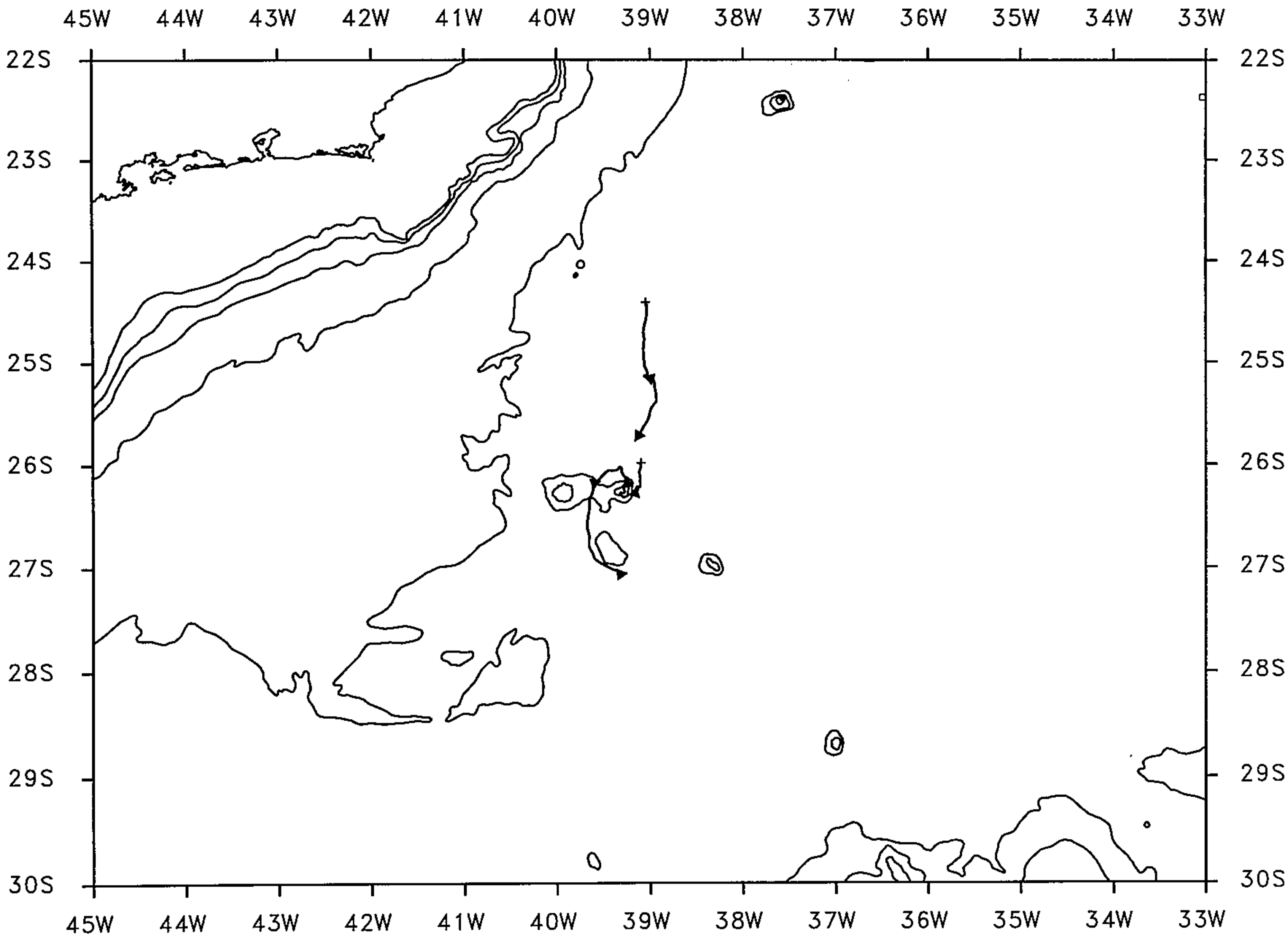
temperature variance= 0.0058 degC*degC

covar(u,temp)= 0.04 cm.degC/s
covar(v,temp)= 0.03 cm.degC/s

Comments:

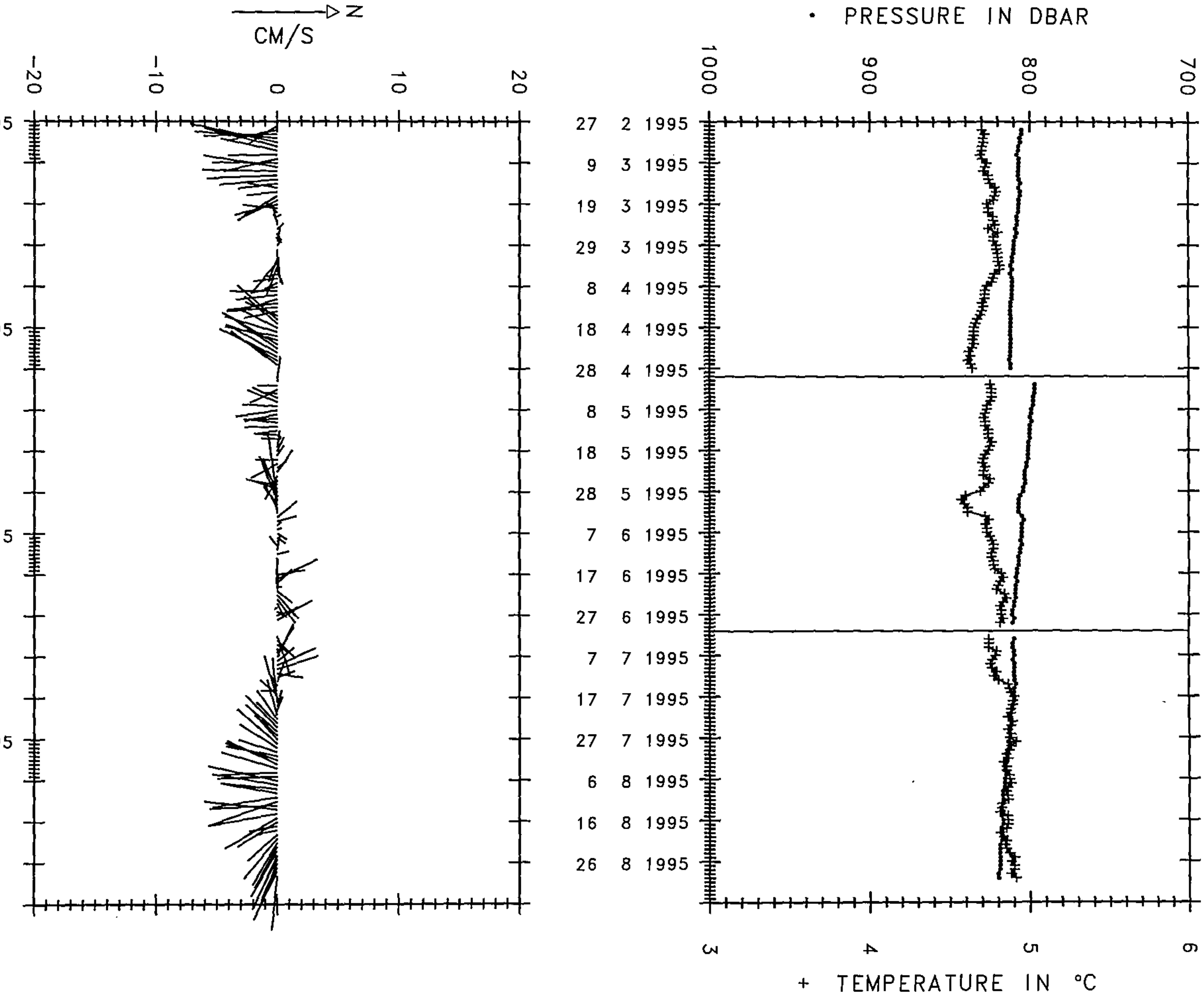


SAMBA M107 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M107 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED

SAMBA M107 CYCLES 7,8 AND 9



EXPERIMENT: SAMBA
FLOAT: MARVOR #108

LAUNCHED AT: 22°29.8'S 32°50.3'W on 19/02/1994 19h08 UT

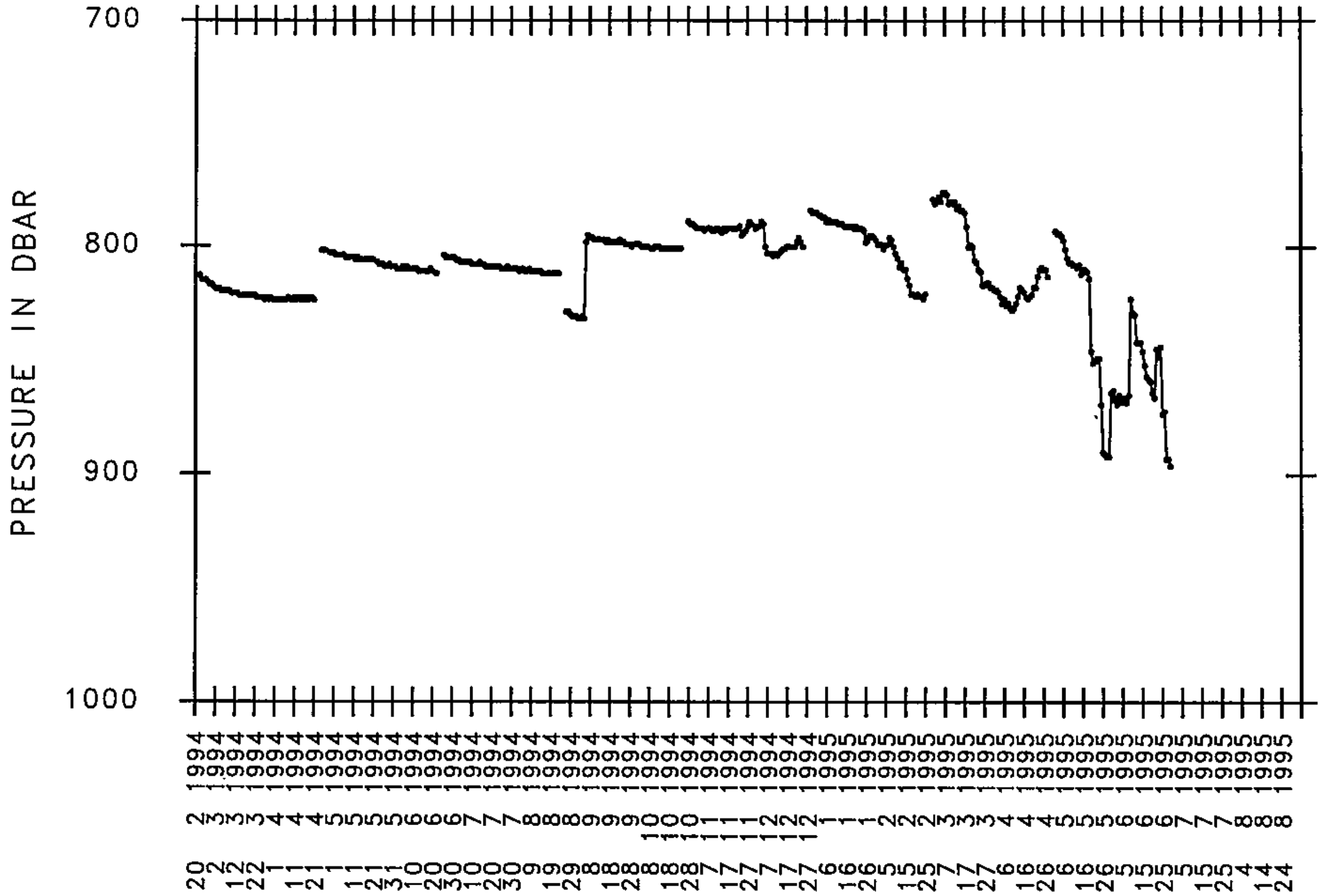
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

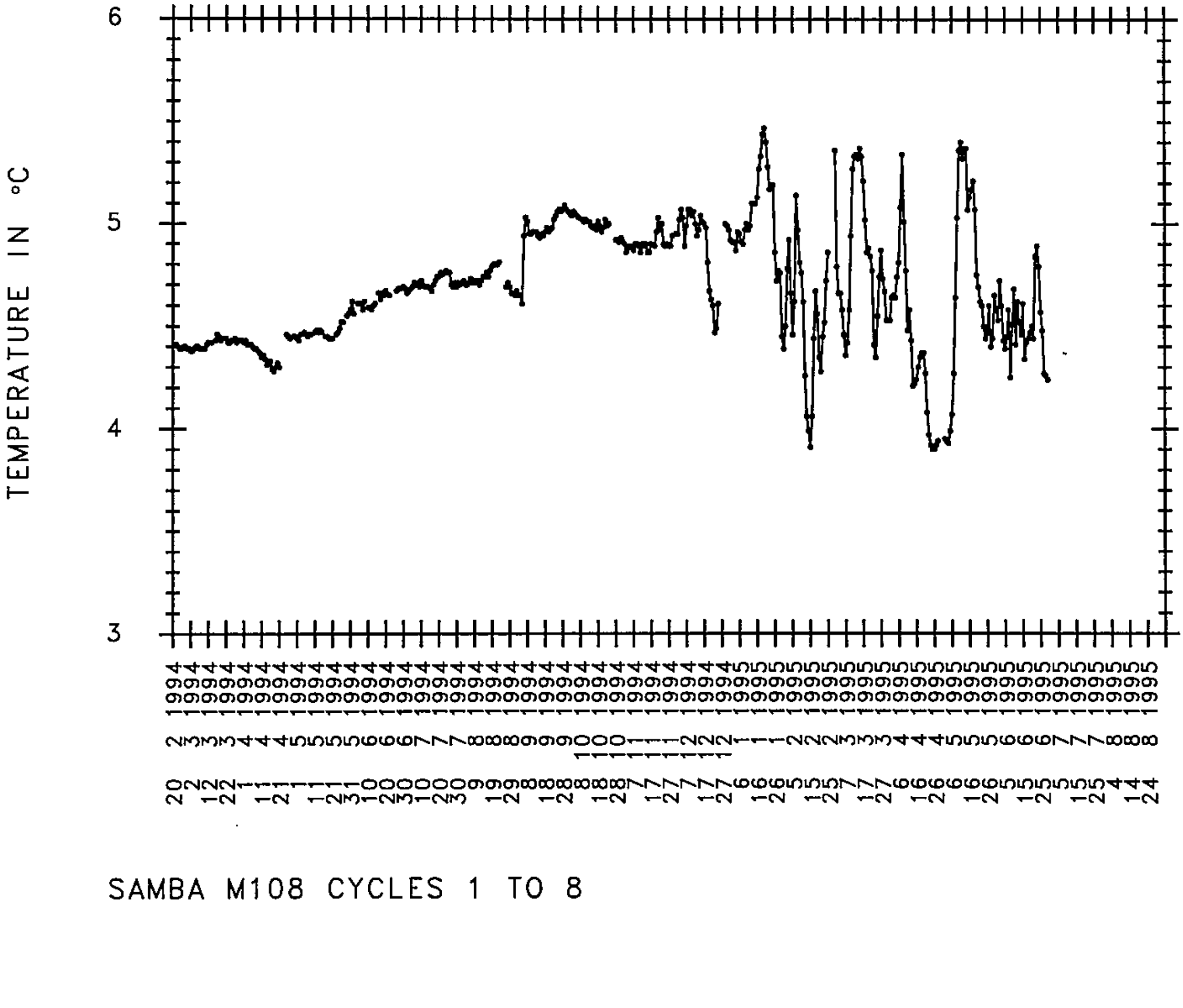
Comments

This float was entrained within the IWBC after 9 months. It then crossed the Vitoria-Trindade chain at its westernmost passage and continued northward within the IWBC (with detrainments at places and reentrainement). It finally reached the launch site of MARVOR #118 and VCM #19 close to Salvador and surfaced ! Unfortunately the surface current brought it toward the shore.

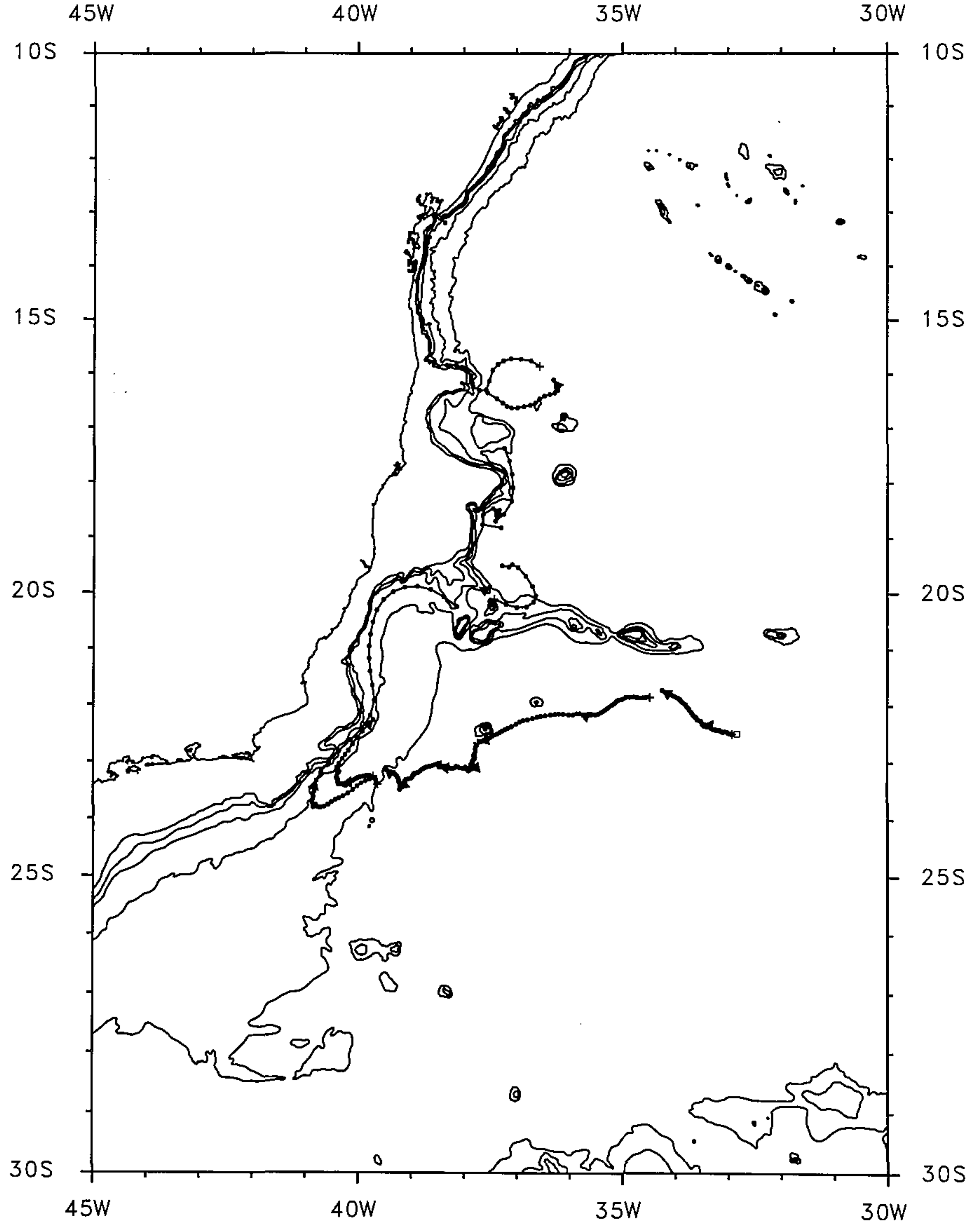
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m108-c1.raw	m108-c1.fin	m108-c1.diaric
m108-c2.raw	m108-c2.fin	m108-c2.diaric
m108-c3.raw	m108-c3.fin	m108-c3.diaric
m108-c4.raw	m108-c4.fin	m108-c4.diaric
m108-c5.raw	m108-c5.fin	m108-c5.diaric
m108-c6.raw	m108-c6.fin	m108-c6.diaric
m108-c7.raw	m108-c7.fin	m108-c7.diaric
m108-c8.raw	m108-c8.fin	m108-c8.diaric





SAMBA M108 CYCLES 1 TO 8



SAMBA M108 (FEBRUARY 1994 - JUNE 1995)

EXPERIMENT: SAMBA

FLOAT: m108
----

launch date	launch lat	launch long
1994 2 19 19h UT	22.497 S	32.838 W

file	m108-c1.fin	m108-c2.fin	m108-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 24 (16185)	1994 6 25 (16247)
1st pos	32.925W 22.503S	34.482W 21.854S	37.732W 22.670S
last pos	34.252W 21.732S	37.707W 22.652S	38.468W 23.091S
1st P and T	813dbar 4.41degC	802dbar 4.46degC	804dbar 4.67degC
last P and T	824dbar 4.30degC	812dbar 4.65degC	812dbar 4.81degC
displacements (East and North)	-137km 86km	-332km -89km	-75km -47km
mean velocities (East and North)	-2.73cm/s 1.71cm/s	-6.51cm/s -1.74cm/s	-1.48cm/s -0.92cm/s
number of pos	59	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 179

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.57 cm/s [-5.07, -2.07]
average north velocity comp.= -0.33 cm/s [-1.42, 0.77]

variances
variance of east velocity comp.= 9.16 cm2/s2 [3.18, 15.15]
variance of north velocity comp.= 4.86 cm2/s2 [1.68, 8.03]

covariance
covariance= 0.83 cm2/s2 [-2.26, 3.91]

Eddy Kinetic Energy
EKE= 7.01 cm2/s2 [3.62, 10.40]

Temperature time series statistics:
----

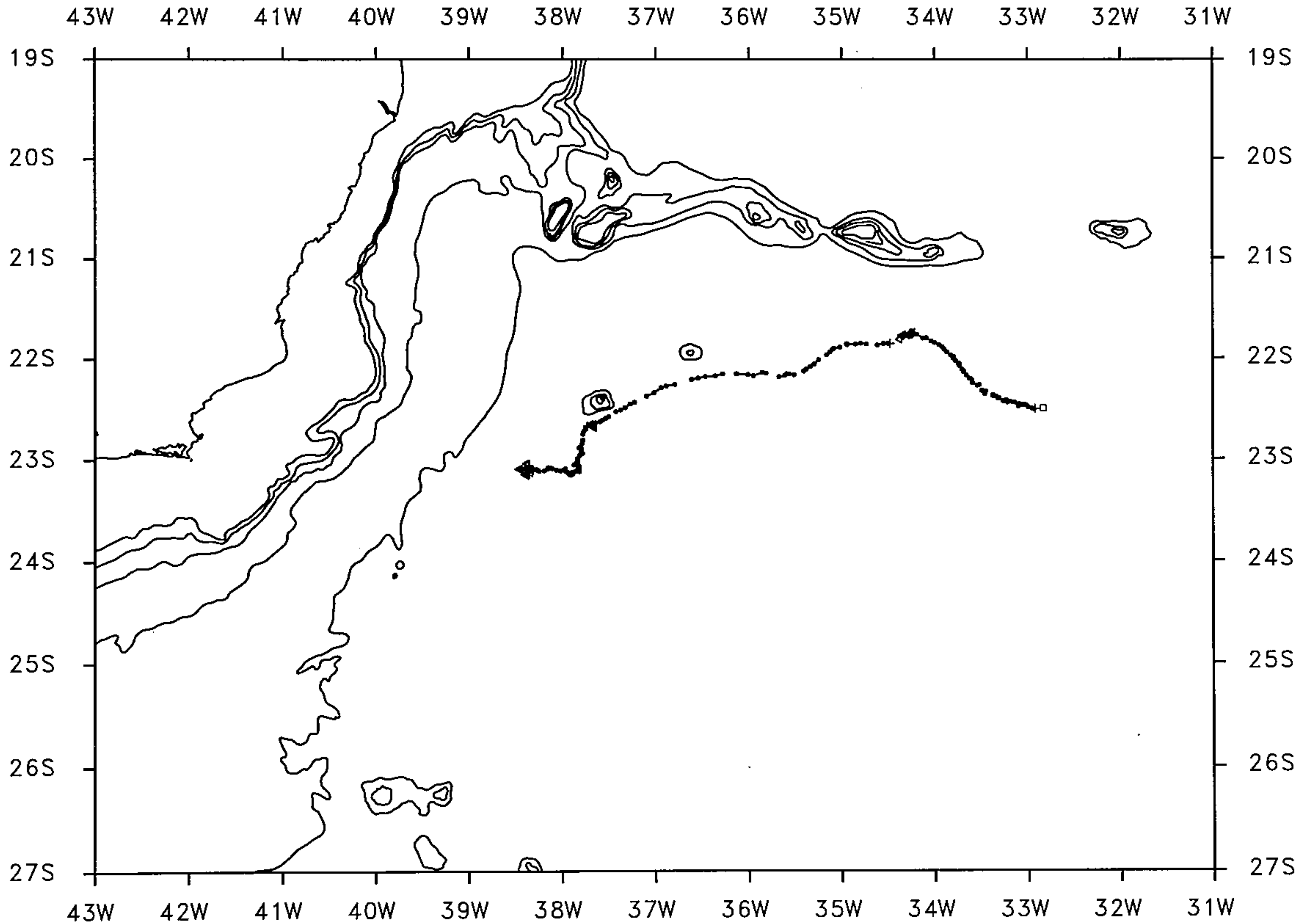
sampling interval= 24 h
number of samples= 165

average temperature= 4.55 degC

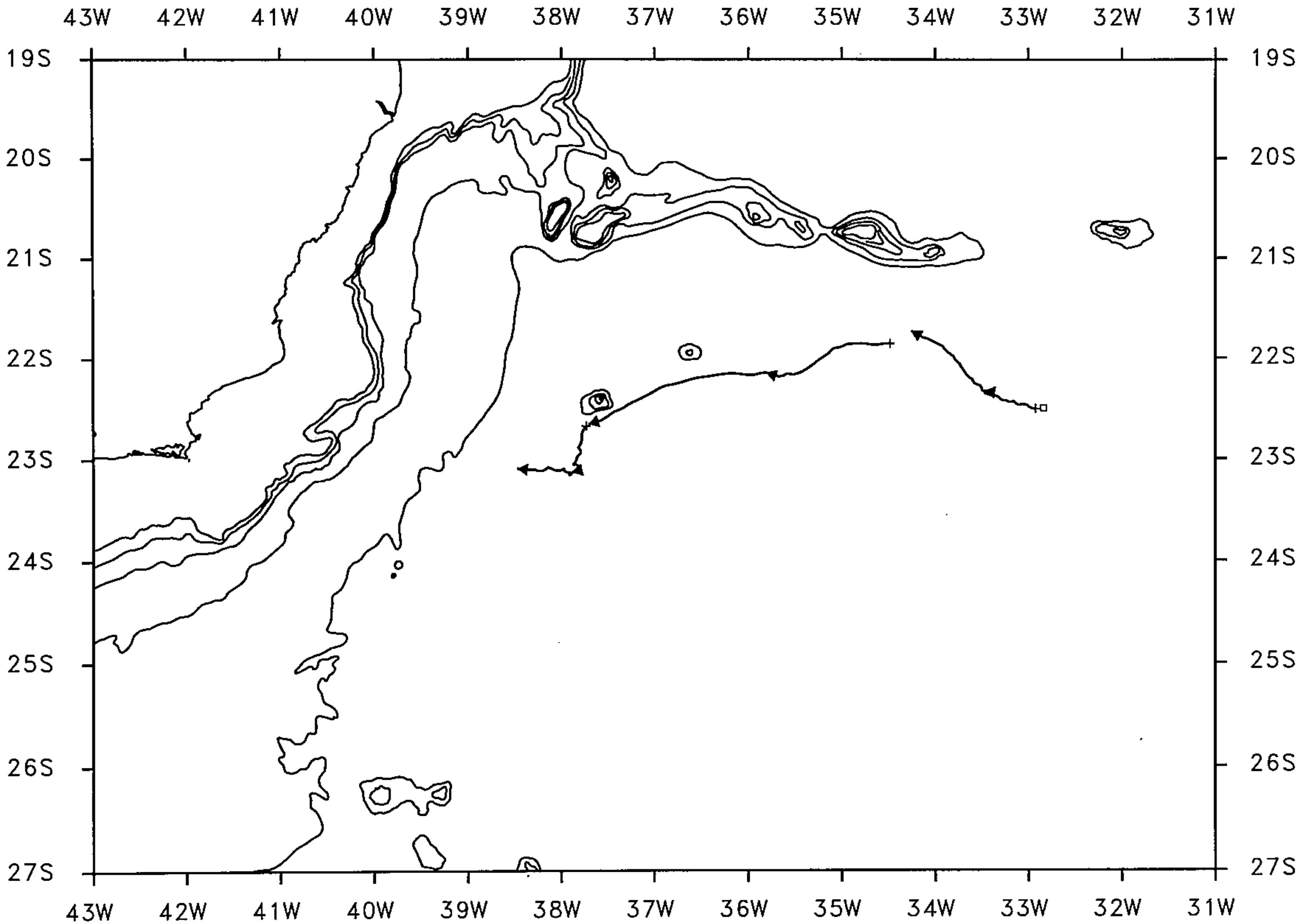
temperature variance= 0.0219 degC*degC

covar(u,temp)= 0.10 cm.degC/s
covar(v,temp)= -0.15 cm.degC/s

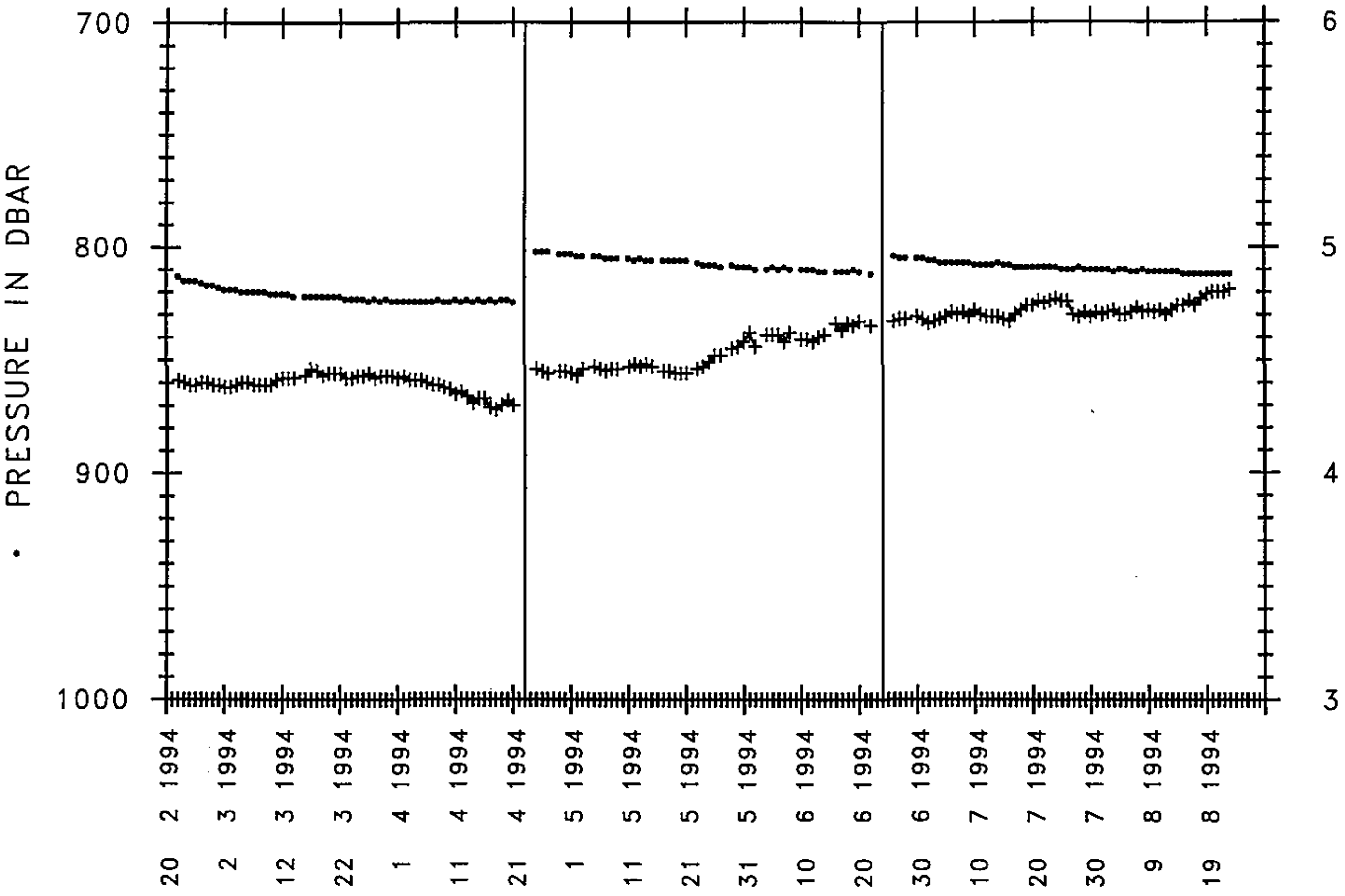
Comments:

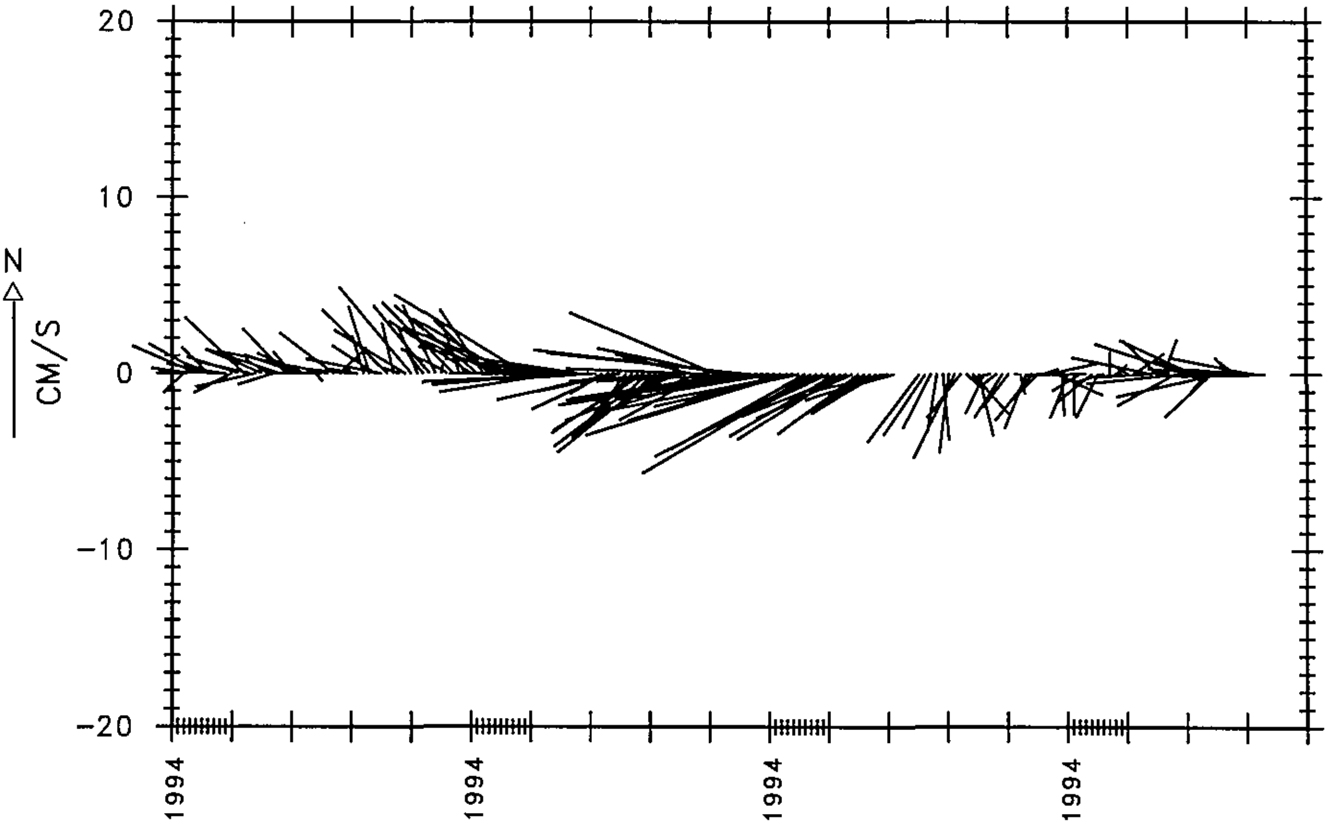


SAMBA M108 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M108 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED





SAMBA M108 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m108

launch date	launch lat	launch long
1994 2 19 19h UT	22.497 S	32.838 W

file	m108-c4.fin	m108-c5.fin	m108-c6.fin
date of 1st pos	1994 8 26 (16309)	1994 10 27 (16371)	1994 12 28 (16433)
1st pos	38.427W 23.042S	39.628W 23.391S	39.712W 23.253S
last pos	39.491W 23.131S	39.717W 22.265S	37.514W 19.885S
1st P and T	829dbar 4.69degC	789dbar 4.92degC	784dbar 5.00degC
last P and T	801dbar 5.00degC	800dbar 4.61degC	821dbar 4.86degC
displacements (East and North)	-109km -10km	-9km 125km	227km 374km
mean velocities (East and North)	-2.13cm/s -0.19cm/s	-0.18cm/s 2.45cm/s	4.46cm/s 7.34cm/s
number of pos	60	60	52

Velocity time series statistics:

sampling interval= 24 h
number of samples= 171

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.39 cm/s [-3.77, 4.54]
average north velocity comp.= 3.01 cm/s [-1.74, 7.77]

variances
variance of east velocity comp.= 65.94 cm2/s2 [21.61, 110.27]
variance of north velocity comp.= 86.32 cm2/s2 [28.29, 144.34]

covariance
covariance= 27.10 cm2/s2 [-8.77, 62.96]

Eddy Kinetic Energy
EKE= 76.13 cm2/s2 [39.62, 112.64]

Temperature time series statistics:

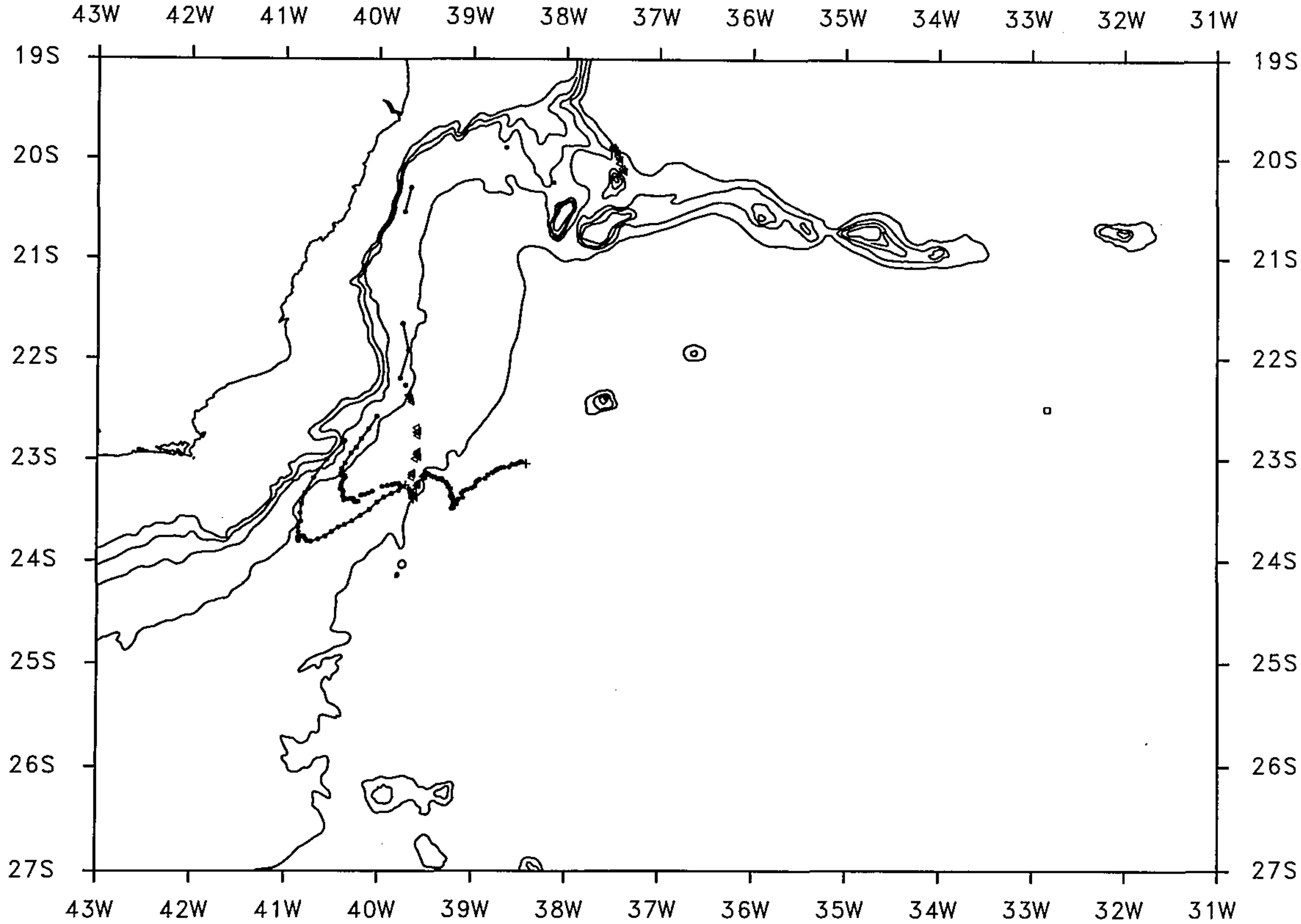
sampling interval= 24 h
number of samples= 164

average temperature= 4.90 degC

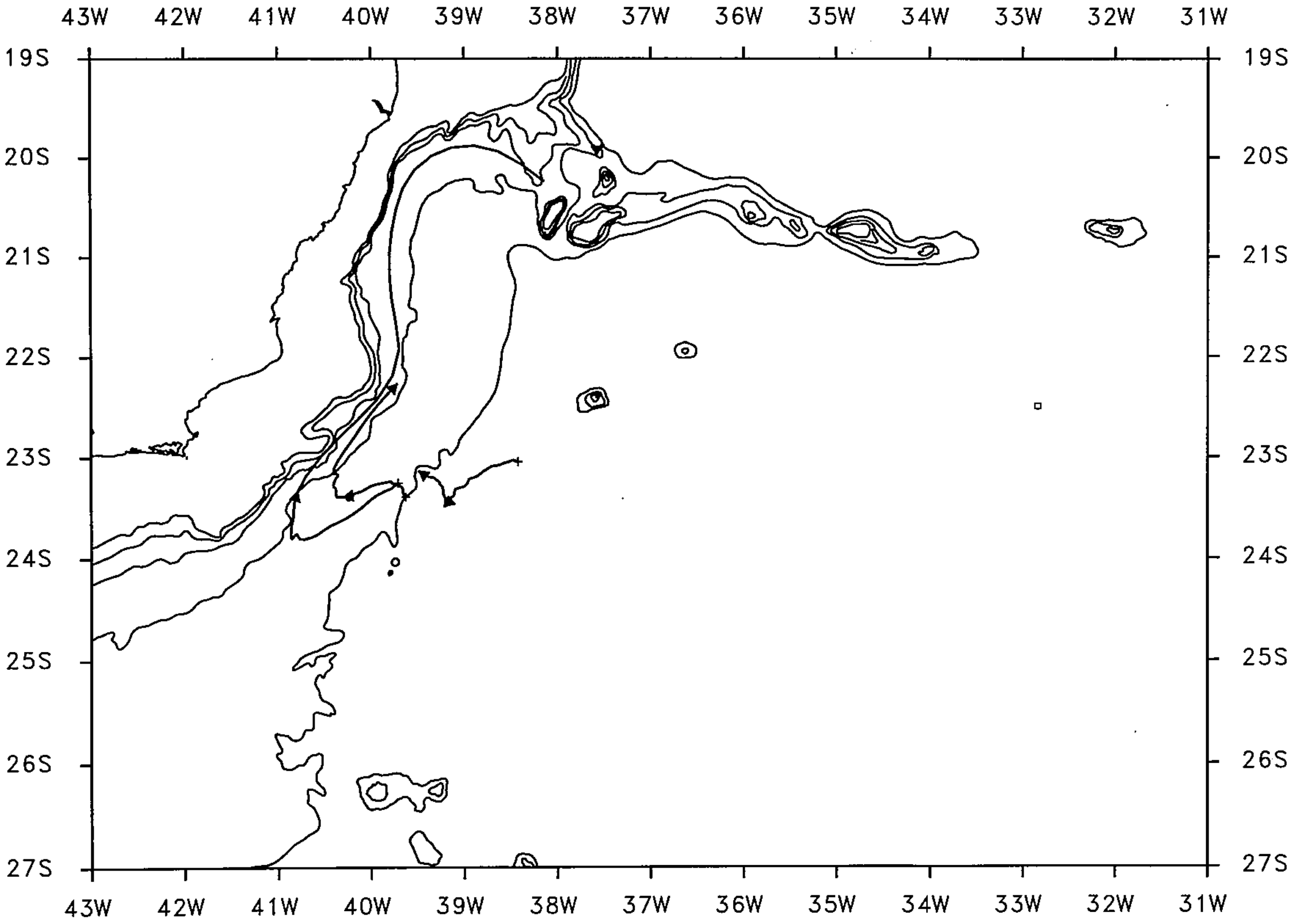
temperature variance= 0.0537 degC*degC

covar(u,temp)= -1.20 cm.degC/s
covar(v,temp)= -0.20 cm.degC/s

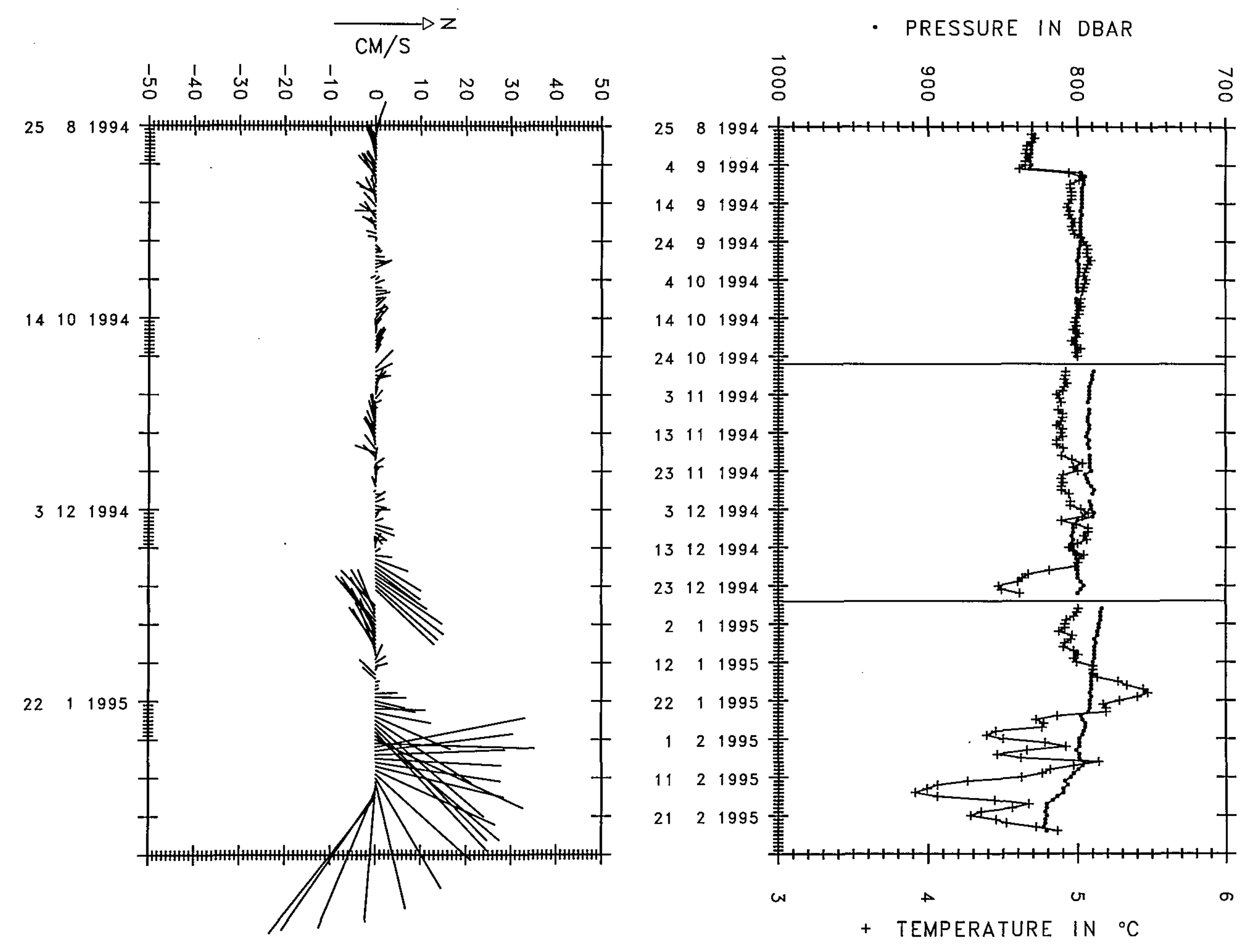
Comments:



SAMBA M108 CYCLES 4,5 AND 6 RAW POSITIONS

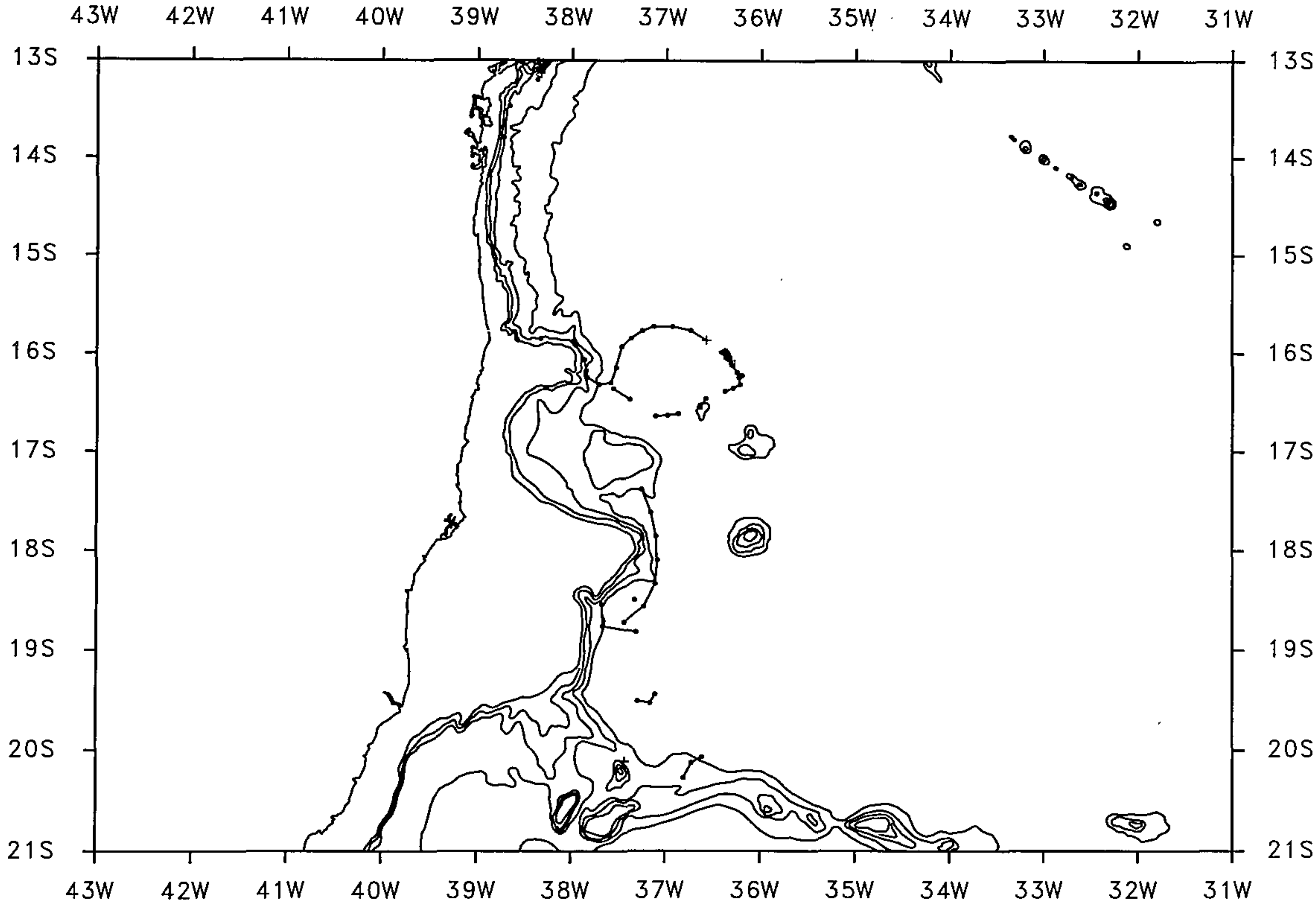


SAMBA M108 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED

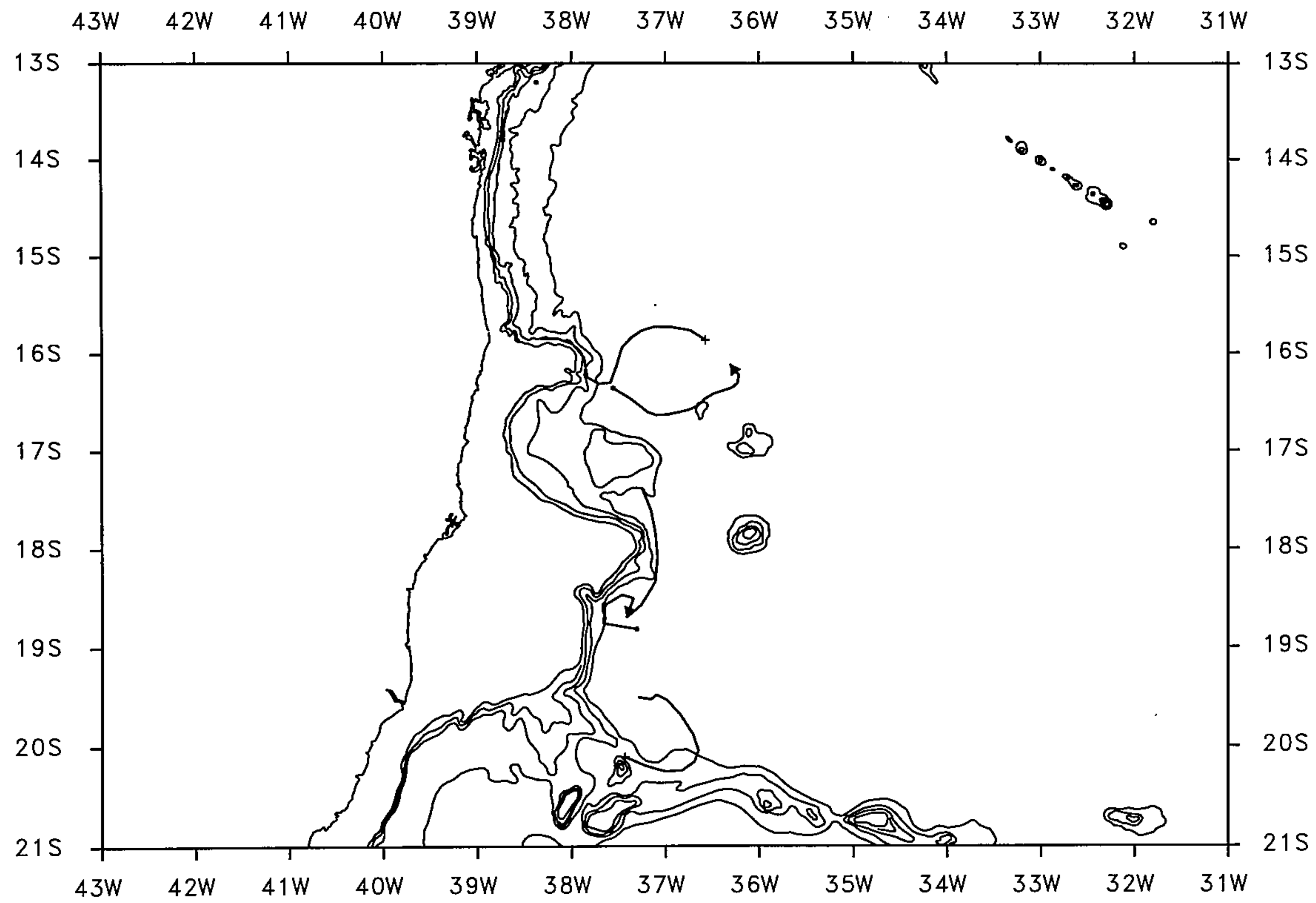


SAMBA M108 CYCLES 4,5 AND 6

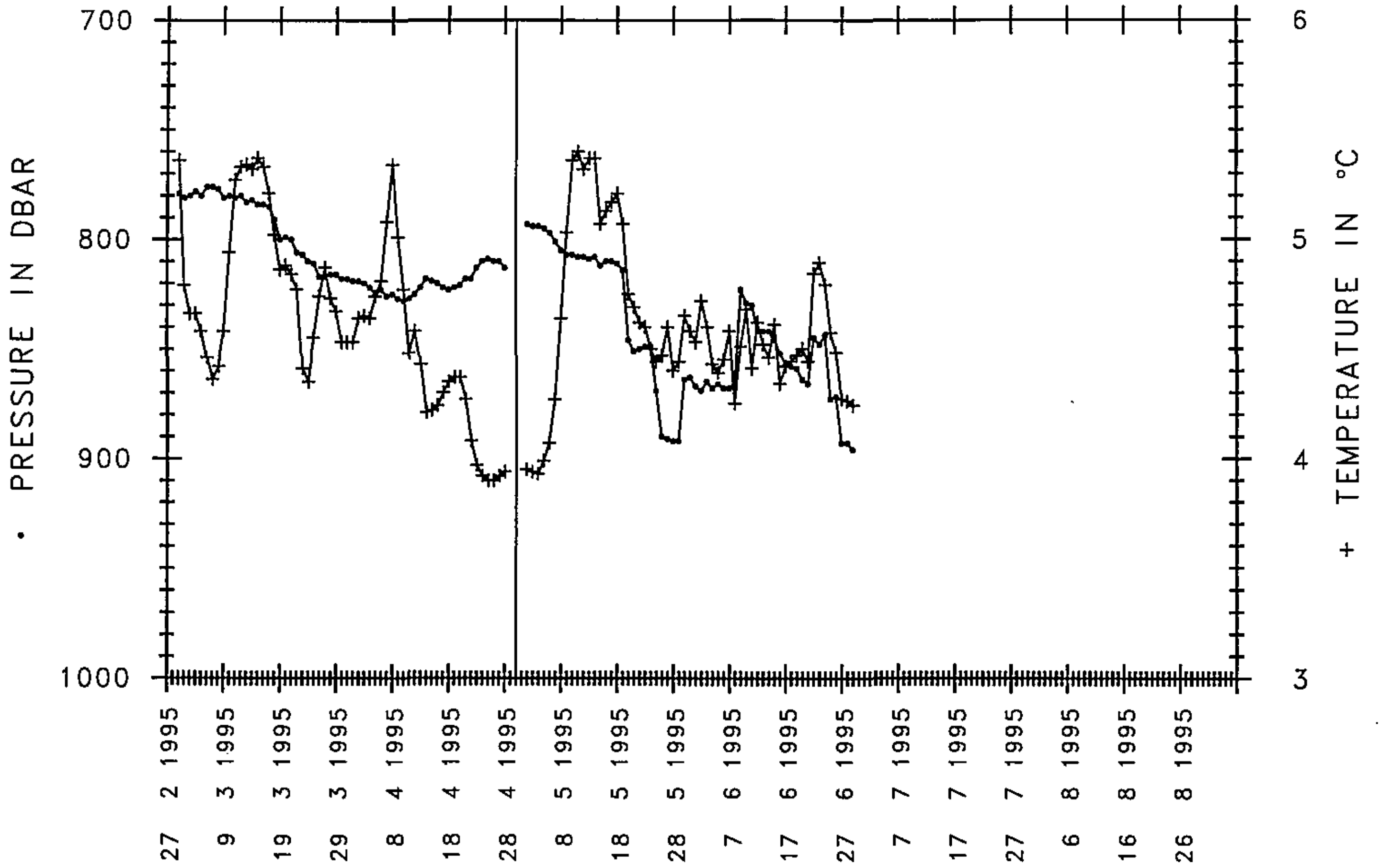
```
EXPERIMENT: SAMBA
-----------------

FLOAT: m108
-----------

  launch date                  launch lat    launch long
 1994  2 19 19h UT               22.497 S      32.838 W

+------------------+----------------------+----------------------+
| file             |      m108-c7.fin     |      m108-c8.fin     |
+------------------+----------------------+----------------------+
| date of 1st pos  | 1995  2 28 (16495)   | 1995  5  1 (16557)   |
| 1st pos          |   37.431W 20.107S    |   36.570W 15.863S    |
| last pos         |   36.305W 16.115S    |   38.371W 13.199S    |
| 1st P and T      |  779dbar  5.36degC   |  793dbar  3.95degC   |
| last P and T     |  813dbar  3.94degC   |  896dbar  4.24degC   |
| displacements    |    119km   444km     |   -194km   296km     |
| (East and North) |                      |                      |
| mean velocities  | 2.33cm/s   8.70cm/s  | -3.93cm/s   6.01cm/s |
| (East and North) |                      |                      |
+------------------+----------------------+----------------------+
| number of pos    |          43          |          22          |
+------------------+----------------------+----------------------+

Velocity time series statistics:
-------------------------------
  sampling interval= 24 h
  number of samples=   64

    6 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
  average east velocity comp.=  -1.12 cm/s  [-17.00, 14.76]
  average north velocity comp.=   5.70 cm/s  [ -7.42, 18.83]

variances
  variance of east velocity comp.=  252.62 cm2/s2  [ -33.25, 538.48]
  variance of north velocity comp.= 172.62 cm2/s2  [ -22.72, 367.96]

covariance
  covariance= -22.27 cm2/s2  [-189.36, 144.83]

Eddy Kinetic Energy
  EKE= 212.62 cm2/s2  [  39.50, 385.74]

Temperature time series statistics:
----------------------------------
  sampling interval= 24 h
  number of samples=   62

  average temperature=   4.53 degC

  temperature variance=    0.1774 degC*degC

  covar(u,temp)=  -0.28 cm.degC/s
  covar(v,temp)=   0.21 cm.degC/s

Comments:
--------
```

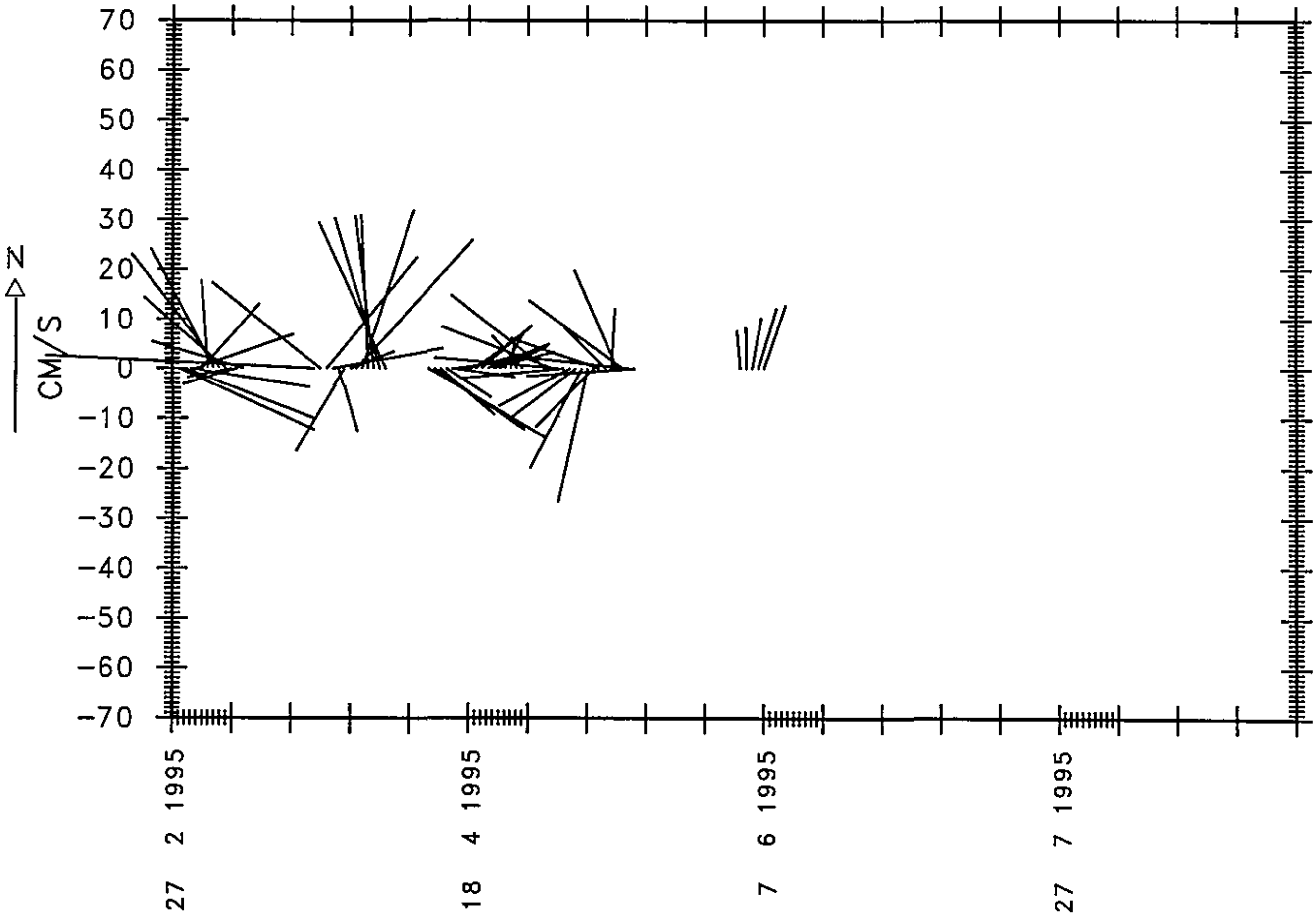


SAMBA M108 CYCLES 7 AND 8 RAW POSITIONS



SAMBA M108 CYCLES 7 AND 8 LANCZOS FILTERED AND SPLINED





SAMBA M108 CYCLES 7 AND 8

EXPERIMENT: SAMBA
FLOAT: MARVOR #109

LAUNCHED AT: 22°37.5'S 32°38.1'W on 19/02/1994 20h58 UT

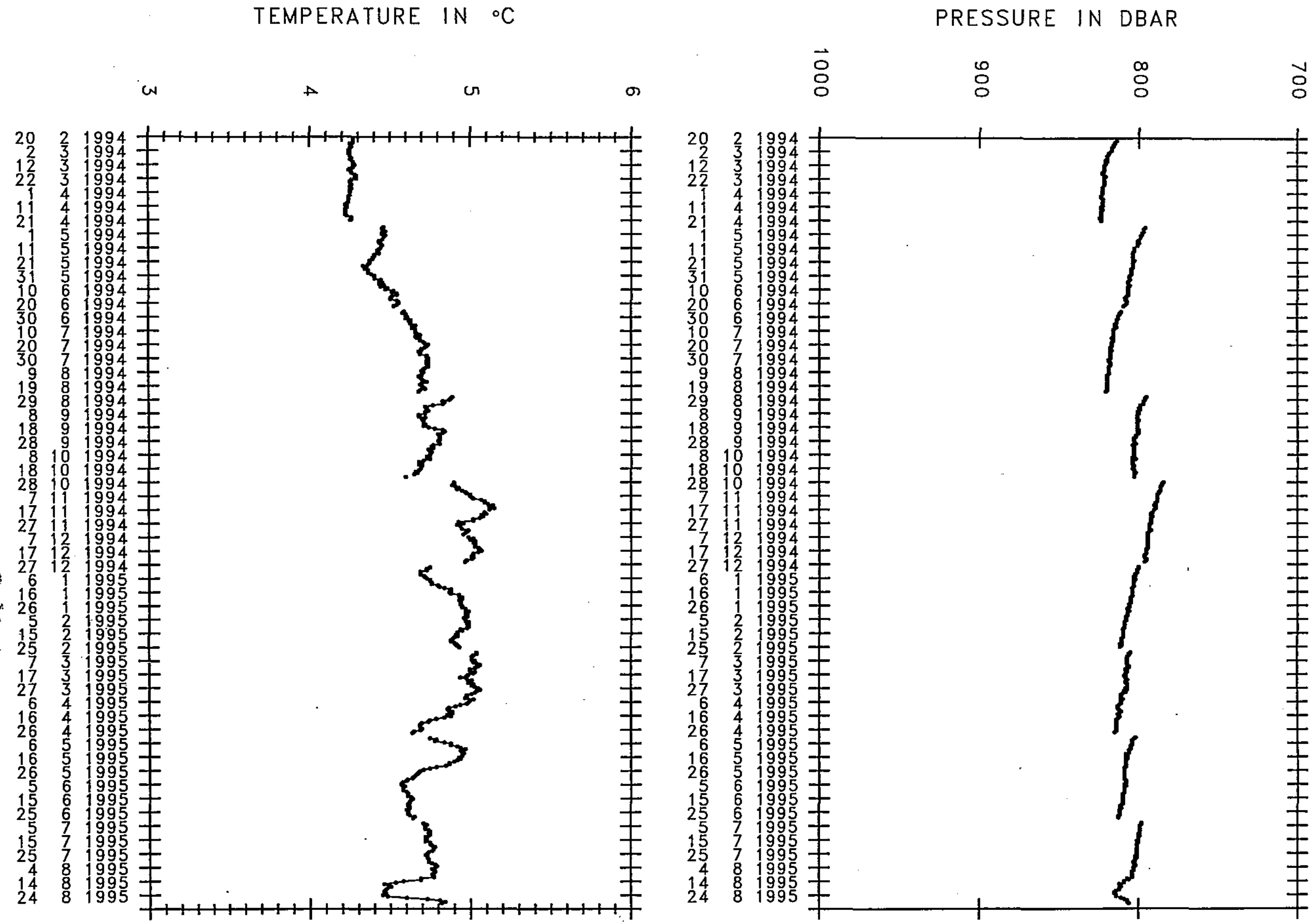
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

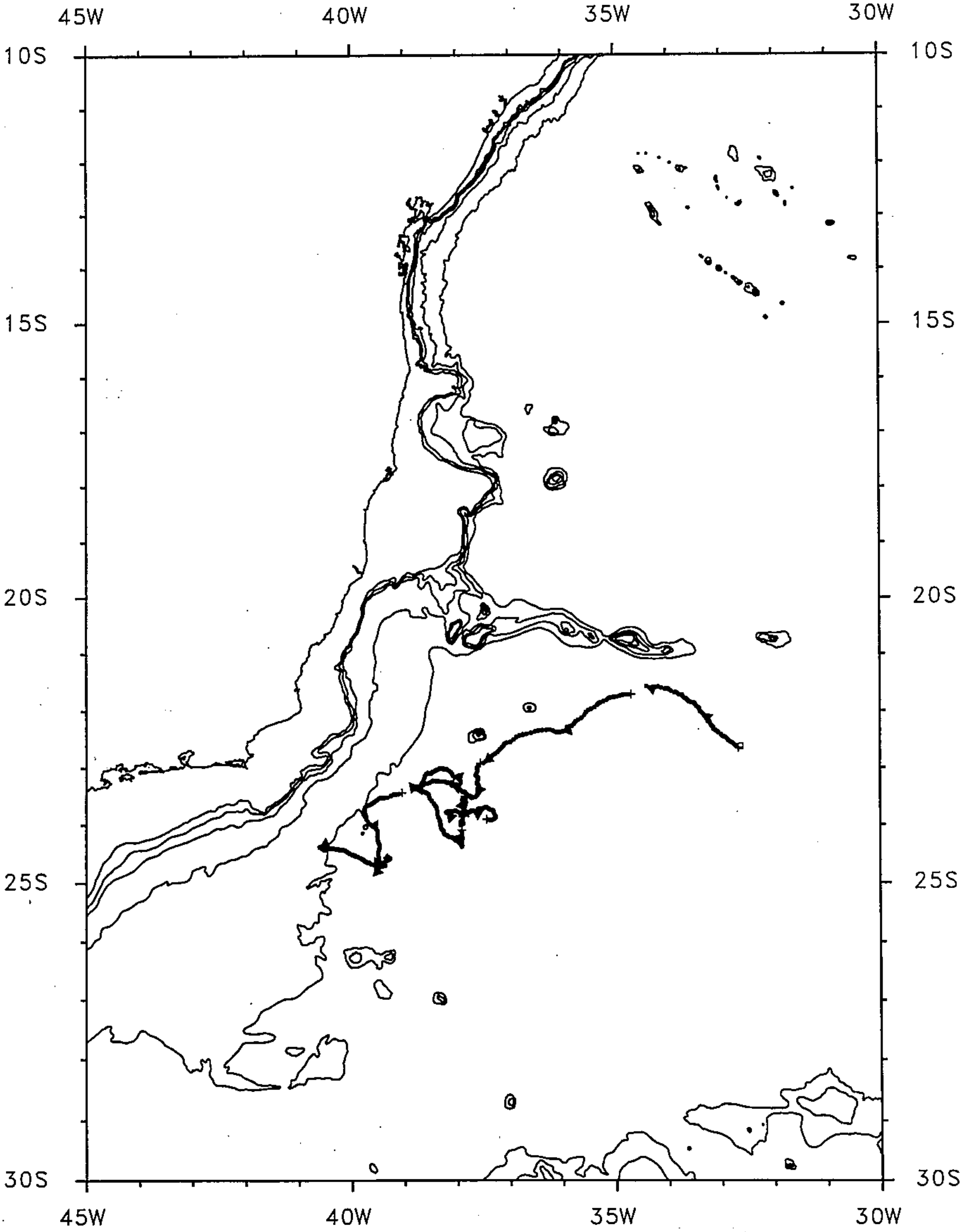
This float shows a general westward flow over its 1.5 year life. After the first 3 cycles however, the circulation is rather sluggish.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m109-c1.raw	m109-c1.fin	m109-c1.diaric
m109-c2.raw	m109-c2.fin	m109-c2.diaric
m109-c3.raw	m109-c3.fin	m109-c3.diaric
m109-c4.raw	m109-c4.fin	m109-c4.diaric
m109-c5.raw	m109-c5.fin	m109-c5.diaric
m109-c6.raw	m109-c6.fin	m109-c6.diaric
m109-c7.raw	m109-c7.fin	m109-c7.diaric
m109-c8.raw	m109-c8.fin	m109-c8.diaric
m109-c9.raw	m109-c9.fin	m109-c9.diaric



SAMBA M109 CYCLES 1 TO 9



SAMBA M109 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m109

launch date	launch lat	launch long
1994 2 19 21h UT	22.625 S	32.635 W

file	m109-c1.fin	m109-c2.fin	m109-c3.fin
date of 1st pos	1994 2 21 (16123)	1994 4 24 (16185)	1994 6 25 (16247)
1st pos	32.670W 22.643S	34.692W 21.710S	37.560W 22.916S
last pos	34.409W 21.568S	37.502W 22.912S	38.113W 23.302S
1st P and T	814dbar 4.27degC	796dbar 4.46degC	811dbar 4.59degC
last P and T	824dbar 4.25degC	810dbar 4.52degC	821dbar 4.68degC
displacements (East and North)	-179km 119km	-289km -134km	-57km -43km
mean velocities (East and North)	-3.51cm/s 2.34cm/s	-5.67cm/s -2.62cm/s	-1.11cm/s -0.84cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.45 cm/s [-4.79, -2.10]
average north velocity comp.= -0.37 cm/s [-1.74, 1.01]

variances
variance of east velocity comp.= 7.39 cm2/s2 [2.56, 12.22]
variance of north velocity comp.= 7.72 cm2/s2 [2.68, 12.77]

covariance
covariance= 0.42 cm2/s2 [-3.07, 3.91]

Eddy Kinetic Energy
EKE= 7.56 cm2/s2 [4.07, 11.05]

Temperature time series statistics:

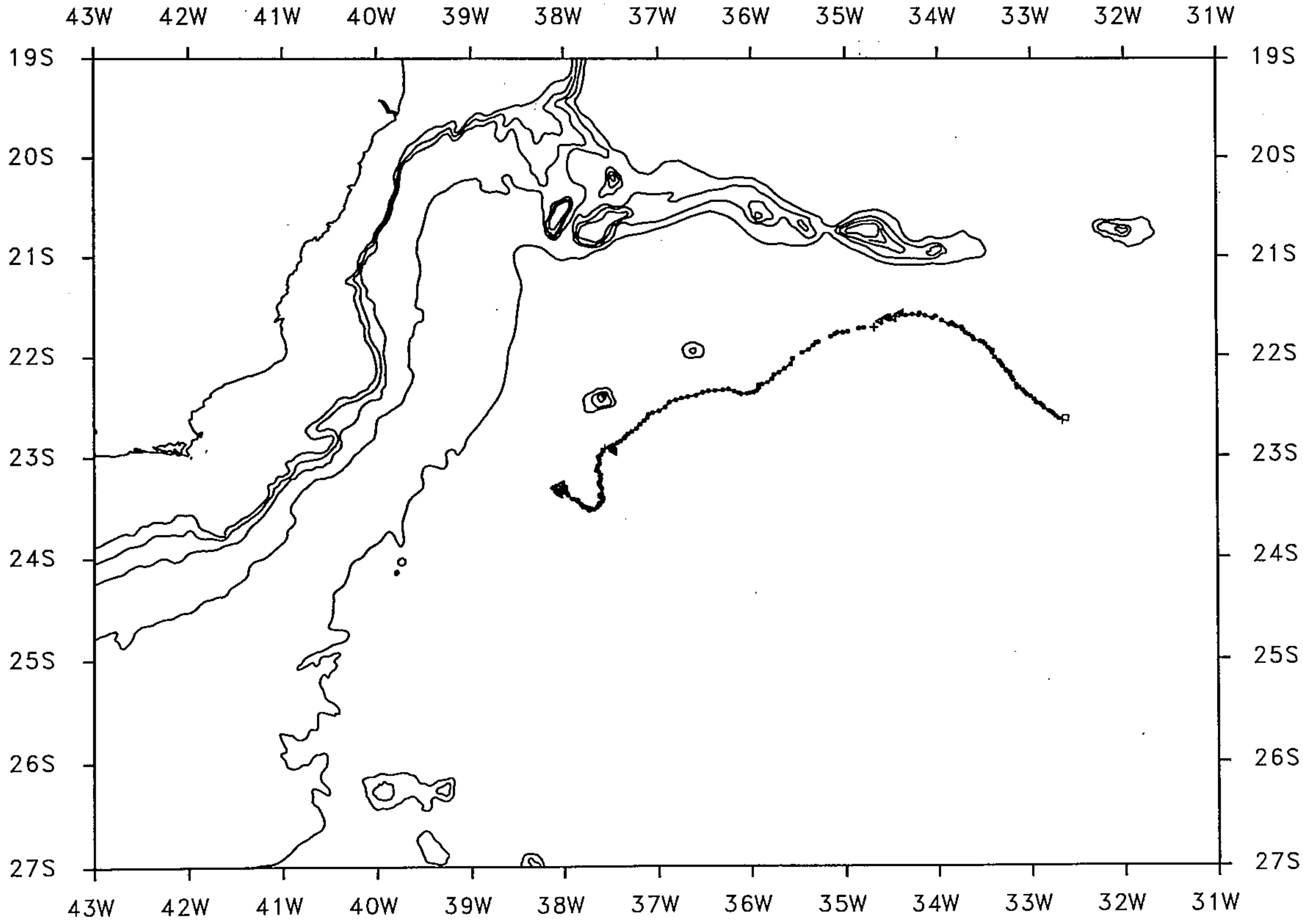
sampling interval= 24 h
number of samples= 171

average temperature= 4.46 degC

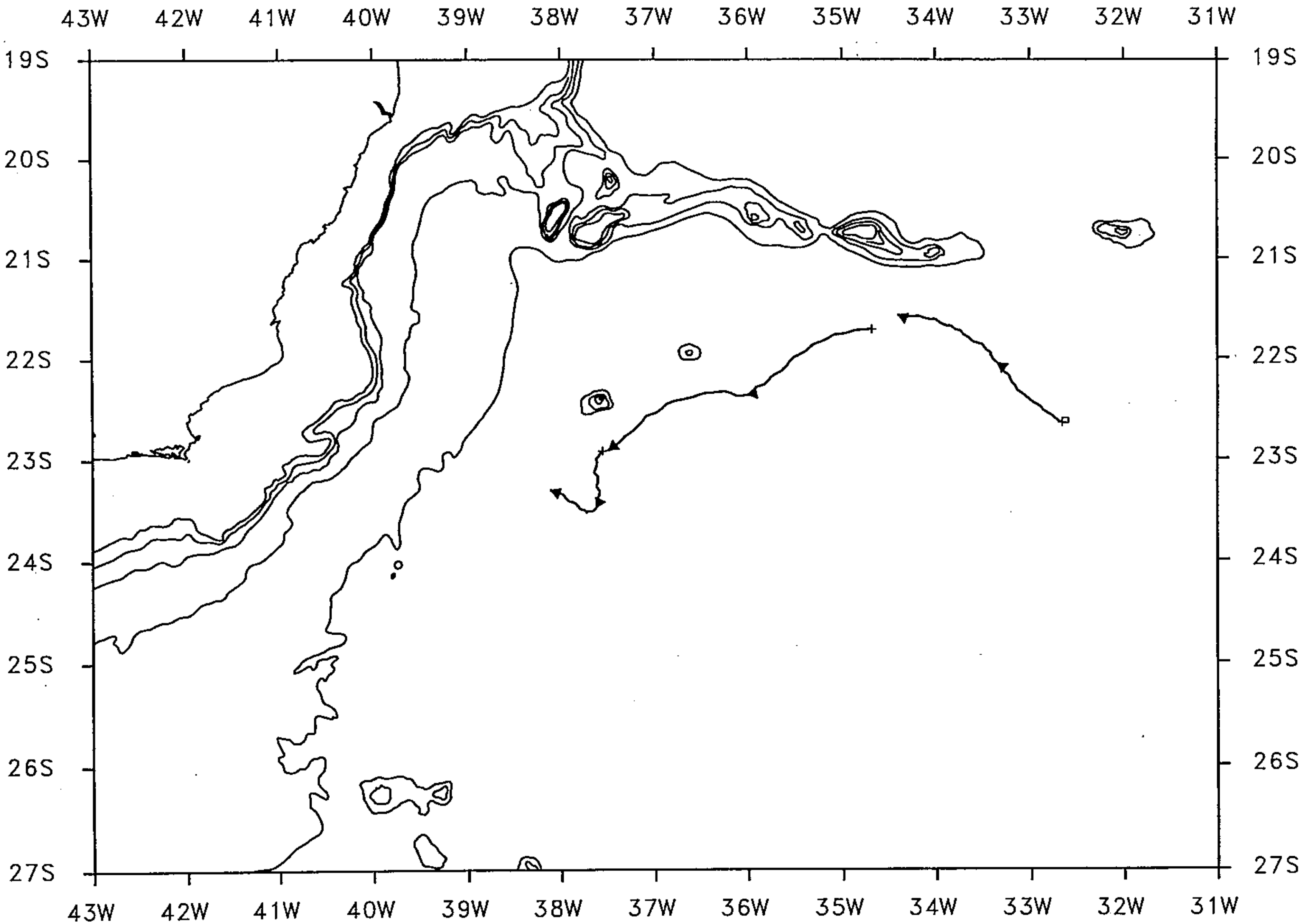
temperature variance= 0.0342 degC*degC

covar(u,temp)= 0.21 cm.degC/s
covar(v,temp)= -0.21 cm.degC/s

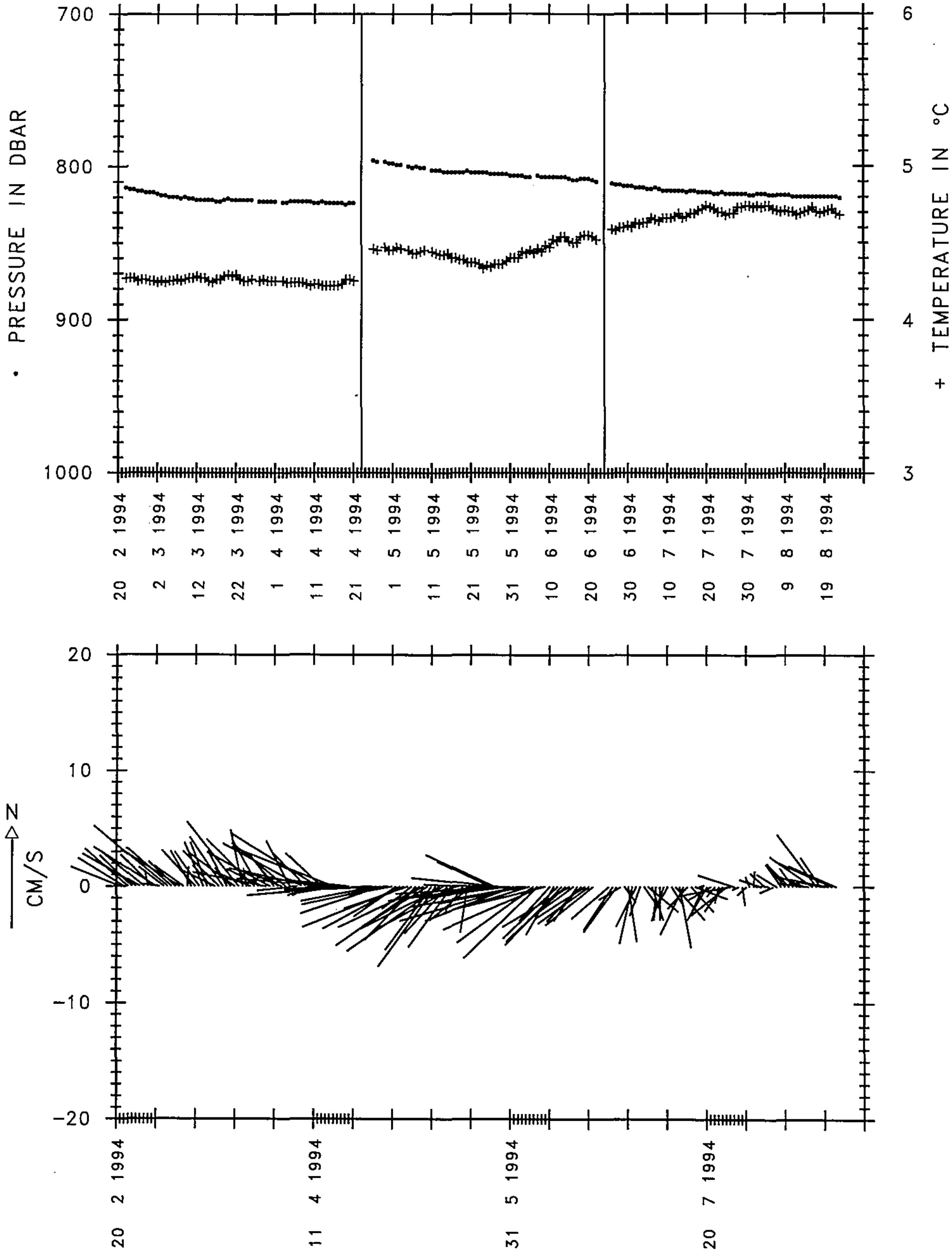
Comments:



SAMBA M109 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M109 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M109 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m109

launch date	launch lat	launch long
1994 2 19 21h UT	22.625 S	32.635 W

file	m109-c4.fin	m109-c5.fin	m109-c6.fin
date of 1st pos	1994 8 26 (16309)	1994 10 27 (16371)	1994 12 28 (16433)
1st pos	38.064W 23.265S	37.854W 23.503S	37.444W 23.903S
last pos	37.931W 23.264S	37.846W 23.756S	38.207W 23.786S
1st P and T	795dbar 4.89degC	784dbar 4.90degC	800dbar 4.75degC
last P and T	803dbar 4.60degC	796dbar 4.97degC	812dbar 4.93degC
displacements (East and North)	14km 0km	1km -28km	-78km 13km
mean velocities (East and North)	0.27cm/s 0.00cm/s	0.02cm/s -0.55cm/s	-1.52cm/s 0.26cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.40 cm/s [-1.70, 0.91]
average north velocity comp.= -0.14 cm/s [-1.36, 1.07]

variances
variance of east velocity comp.= 6.96 cm2/s2 [2.41, 11.50]
variance of north velocity comp.= 6.04 cm2/s2 [2.09, 9.98]

covariance
covariance= 0.11 cm2/s2 [-2.88, 3.11]

Eddy Kinetic Energy
EKE= 6.50 cm2/s2 [3.49, 9.51]

Temperature time series statistics:

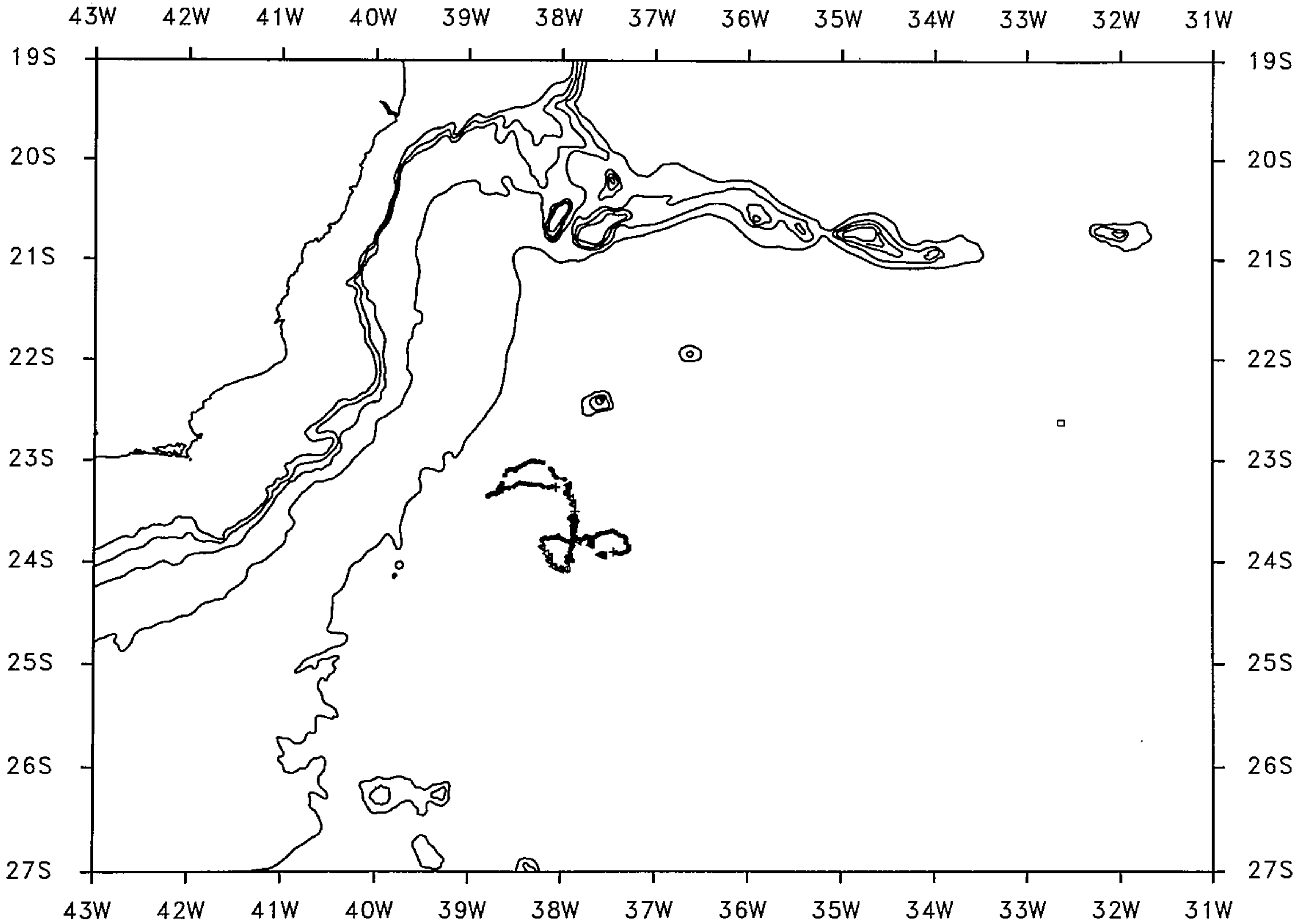
sampling interval= 24 h
number of samples= 171

average temperature= 4.88 degC

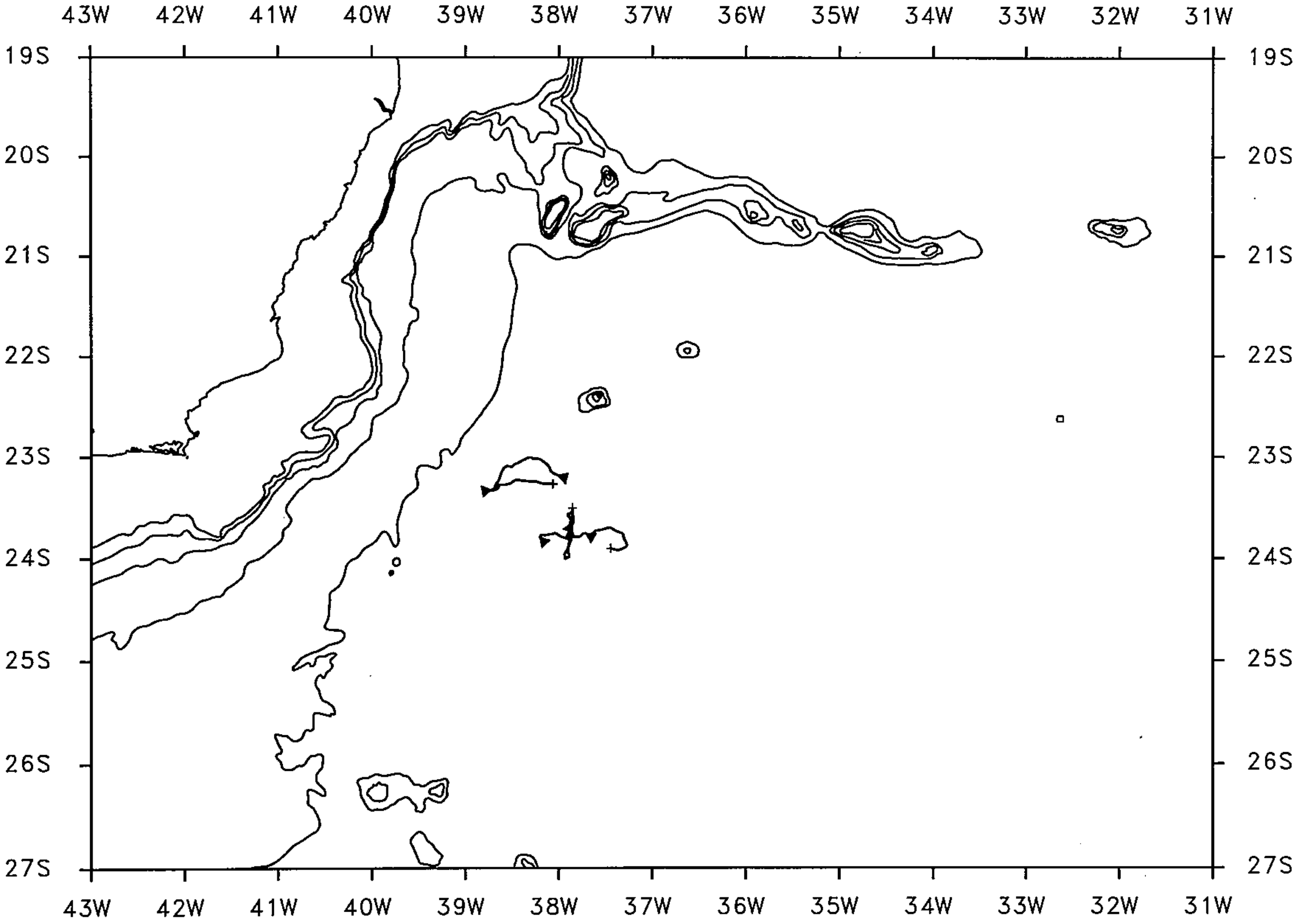
temperature variance= 0.0171 degC*degC

covar(u,temp)= -0.05 cm.degC/s
covar(v,temp)= 0.01 cm.degC/s

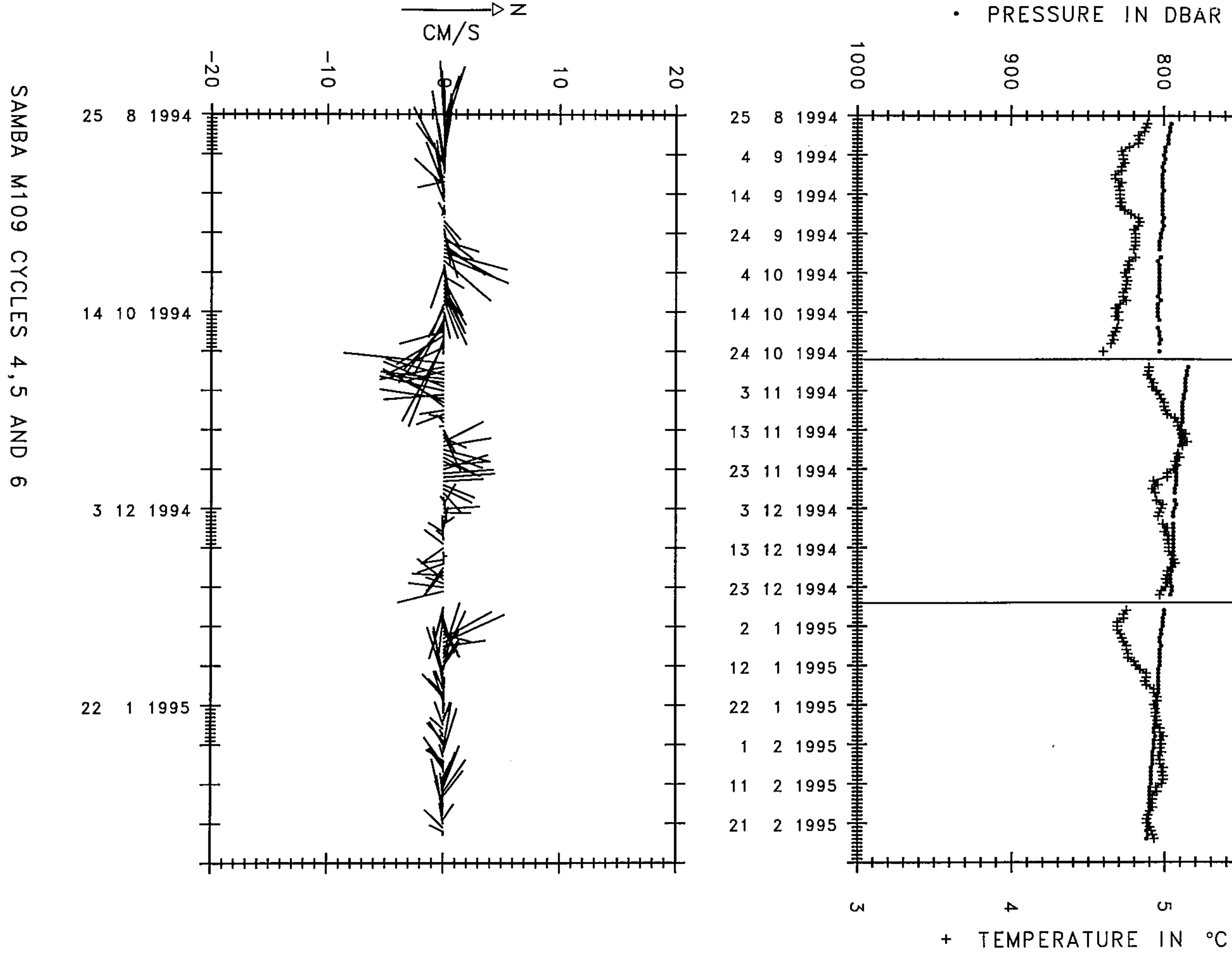
Comments:



SAMBA M109 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M109 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED


SAMBA M109 CYCLES 4,5 AND 6
CM/S
N
-20
-10
0
10
20
25 8 1994
14 10 1994
3 12 1994
22 1 1995
PRESSURE IN DBAR
1000
900
800
700
4 9 1994
14 9 1994
24 9 1994
4 10 1994
24 10 1994
3 11 1994
13 11 1994
23 11 1994
13 12 1994
23 12 1994
2 1 1995
12 1 1995
1 2 1995
11 2 1995
21 2 1995
3
4
5
6
TEMPERATURE IN °C

EXPERIMENT: SAMBA

FLOAT: m109

launch date	launch lat	launch long
1994 2 19 21h UT	22.625 S	32.635 W

file	m109-c7.fin	m109-c8.fin	m109-c9.fin
date of 1st pos	1995 2 28 (16495)	1995 5 1 (16557)	1995 7 2 (16619)
1st pos	37.913W 24.094S	39.044W 23.436S	39.326W 24.562S
last pos	38.839W 23.371S	39.392W 24.652S	40.605W 24.381S
1st P and T	805dbar 5.04degC	802dbar 4.75degC	798dbar 4.71degC
last P and T	815dbar 4.64degC	813dbar 4.64degC	806dbar 4.82degC
displacements (East and North)	-94km 80km	-35km -135km	-129km 20km
mean velocities (East and North)	-1.85cm/s 1.58cm/s	-0.69cm/s -2.65cm/s	-2.54cm/s 0.39cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.71 cm/s [-3.03, -0.40]
average north velocity comp.= -0.24 cm/s [-1.62, 1.15]

variances
variance of east velocity comp.= 7.07 cm2/s2 [2.45, 11.68]
variance of north velocity comp.= 7.86 cm2/s2 [2.73, 13.00]

covariance
covariance= -2.63 cm2/s2 [-6.07, 0.81]

Eddy Kinetic Energy
EKE= 7.46 cm2/s2 [4.01, 10.92]

Temperature time series statistics:

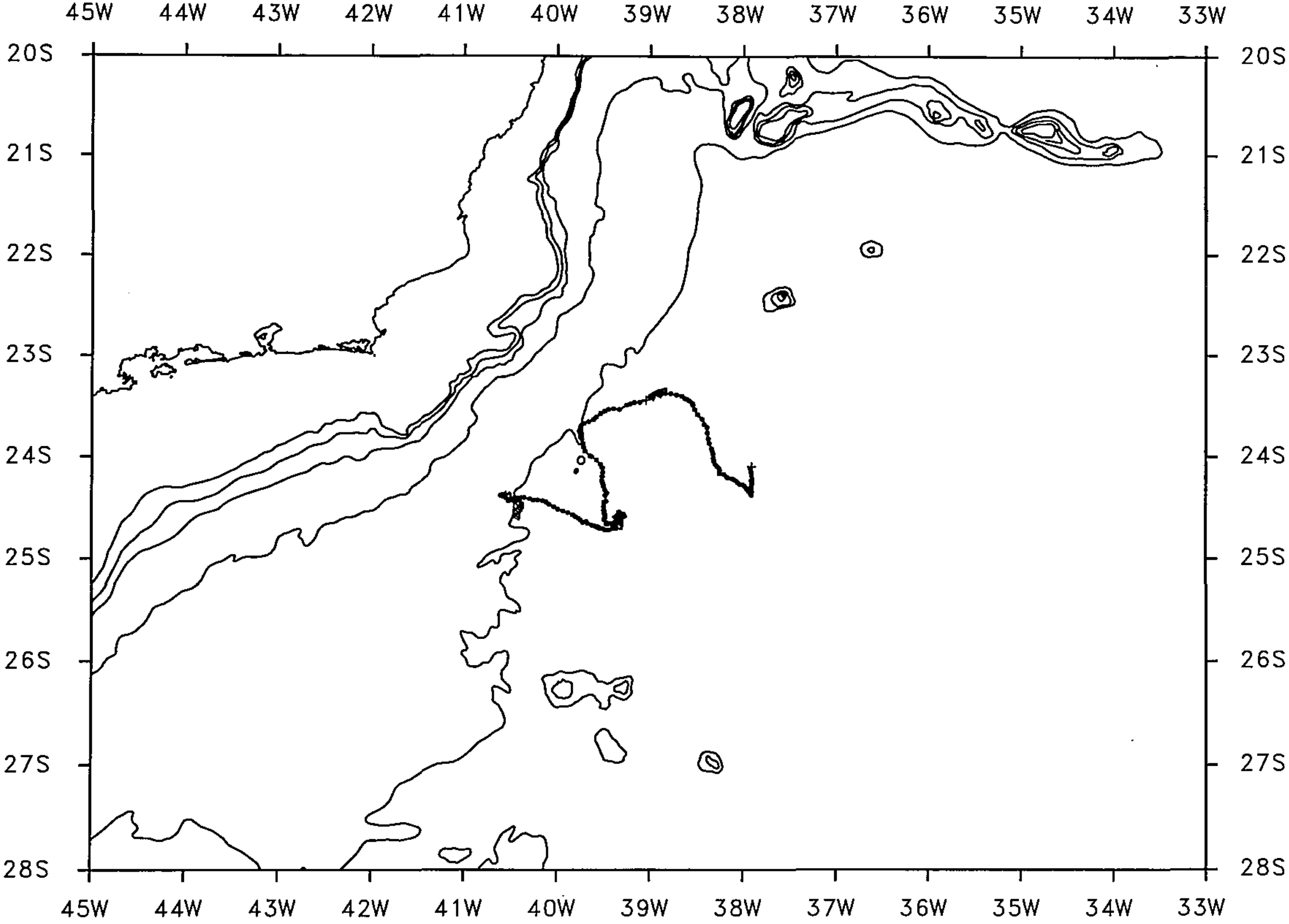
sampling interval= 24 h
number of samples= 177

average temperature= 4.78 degC

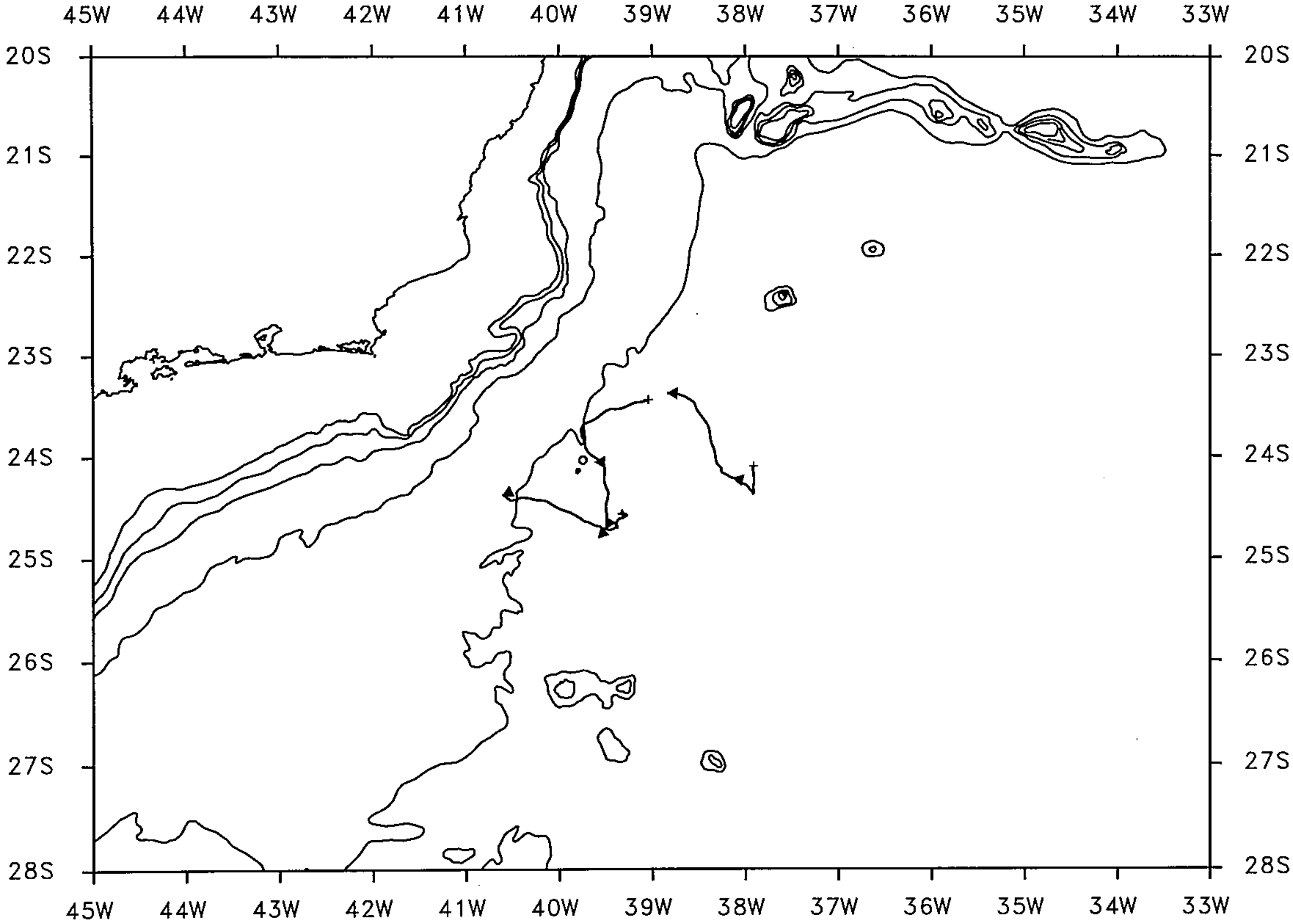
temperature variance= 0.0270 degC*degC

covar(u,temp)= 0.01 cm.degC/s
covar(v,temp)= 0.06 cm.degC/s

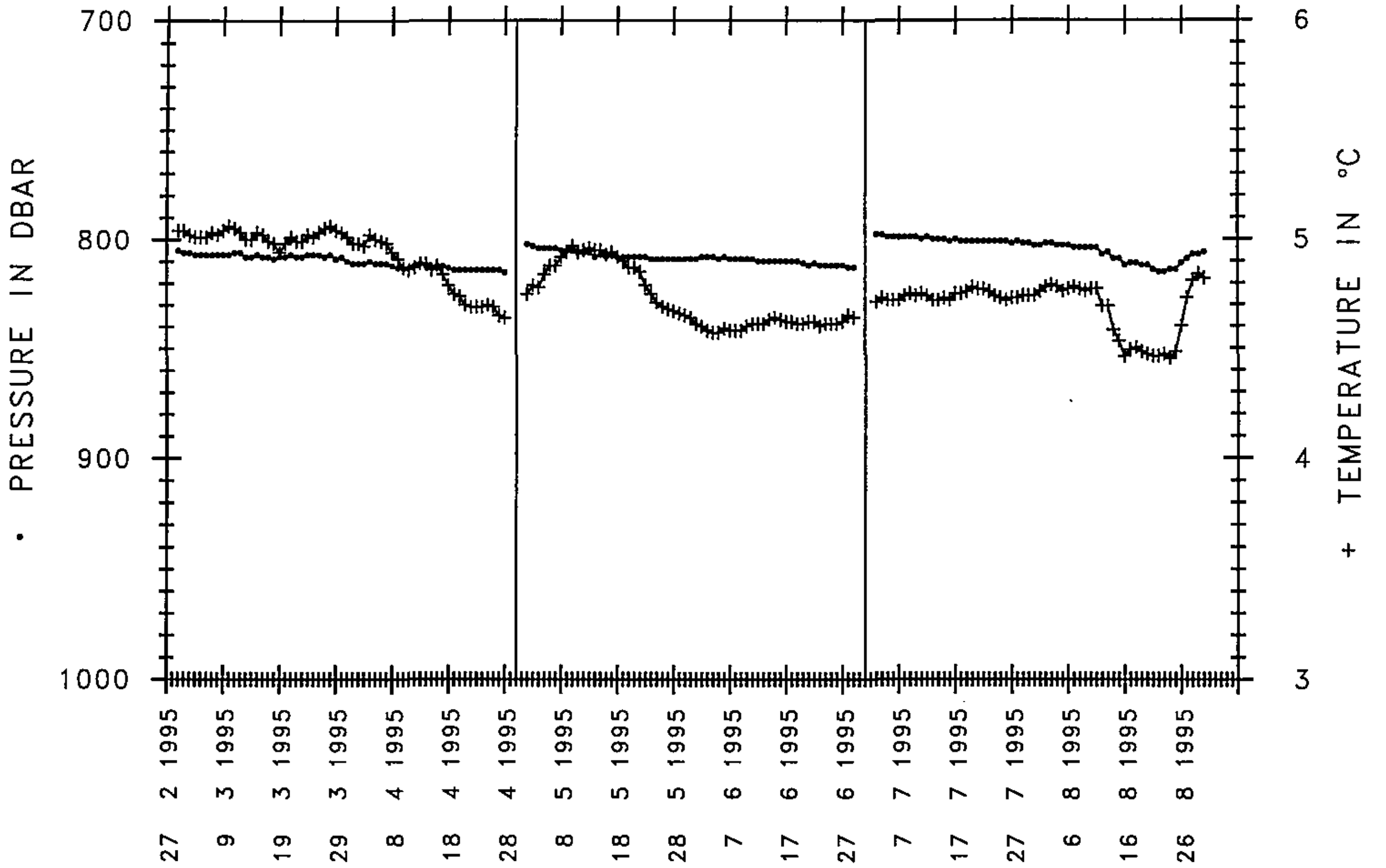
Comments:

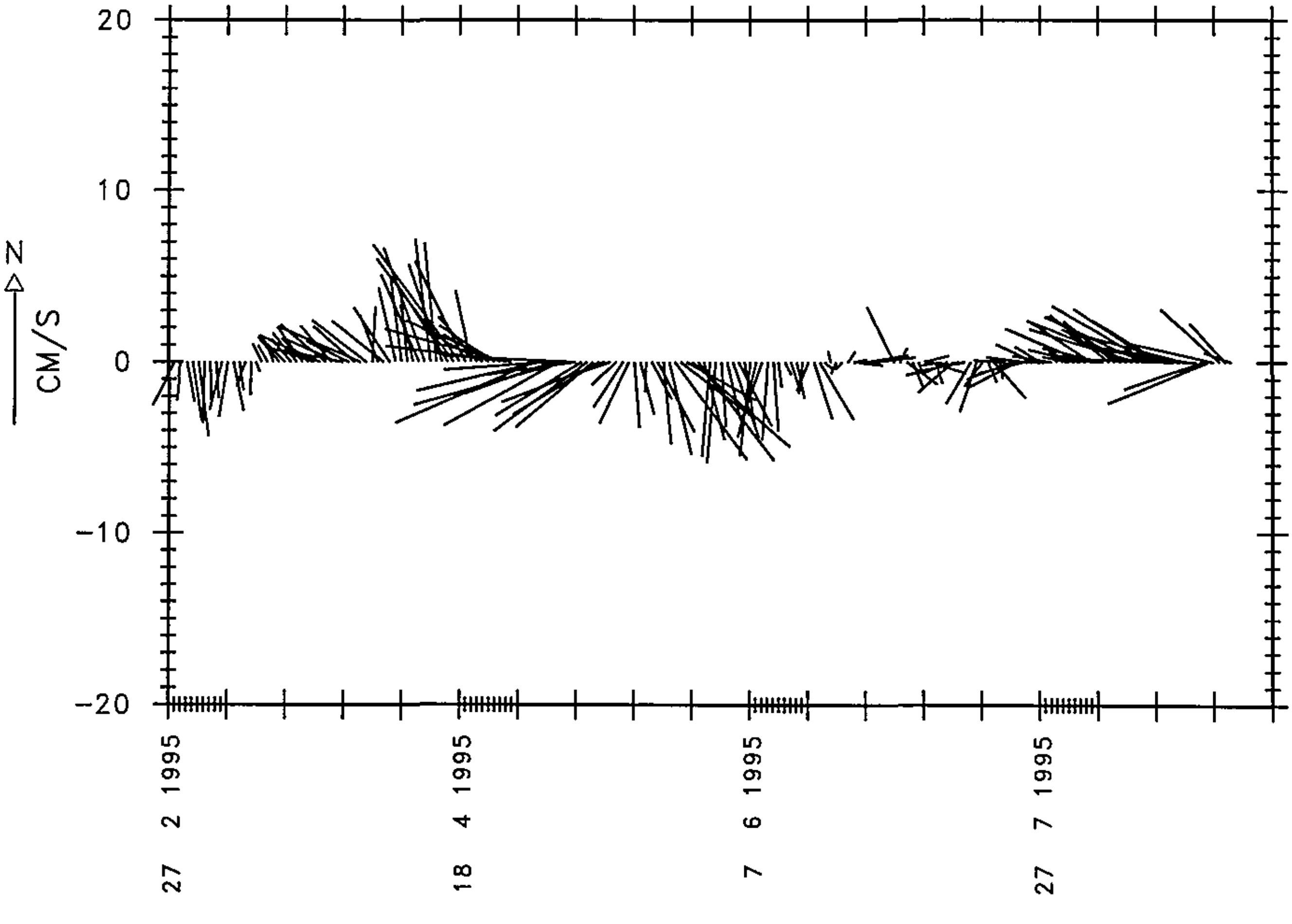


SAMBA M109 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M109 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M109 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #110

LAUNCHED AT: 22°19.0'S 32°42.0'W on 19/02/1994 22h53 UT

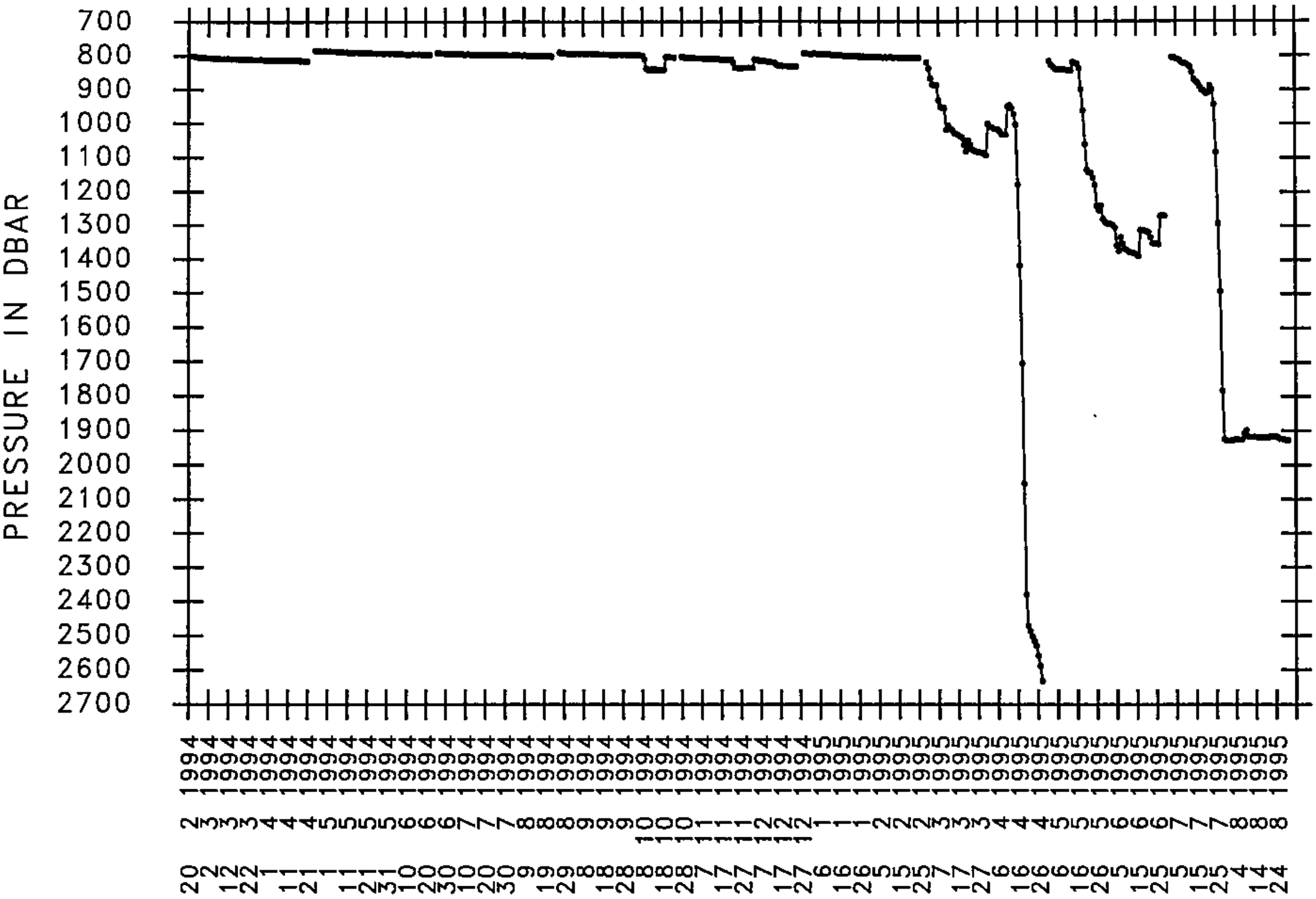
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

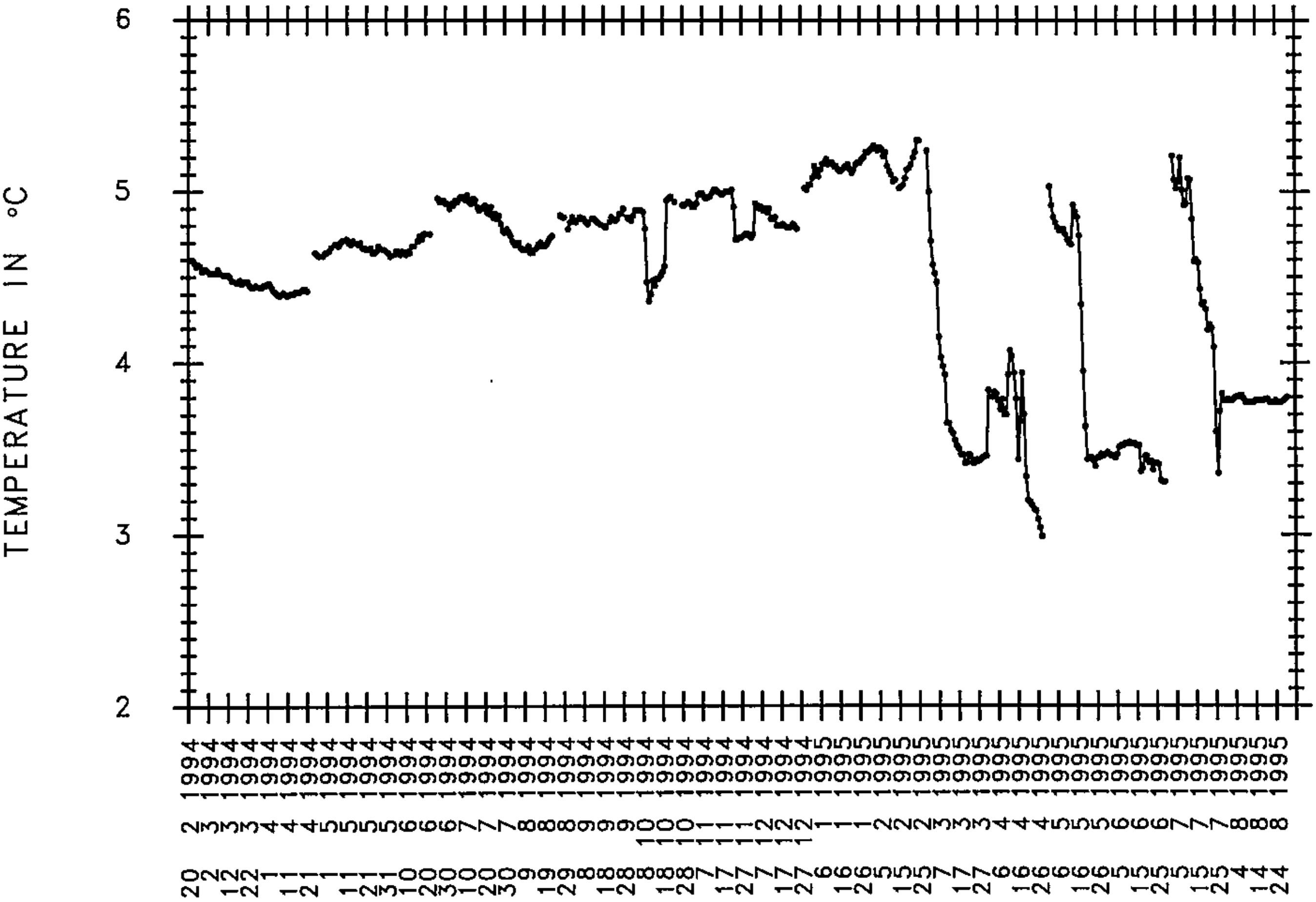
Comments

This float shows a general southwest flow and is probably being entrained within the IWBC during its last cycle.
However, it has experienced the worst deepening of all our MARVORs. It dived down to 2600 dbar at the end of its seventh cycle, to 1300 dbar during cycle #8 and to 1900 dbar during cycle #9. As a consequence, the float was deeper than 900 dbar for a total of 135 days.

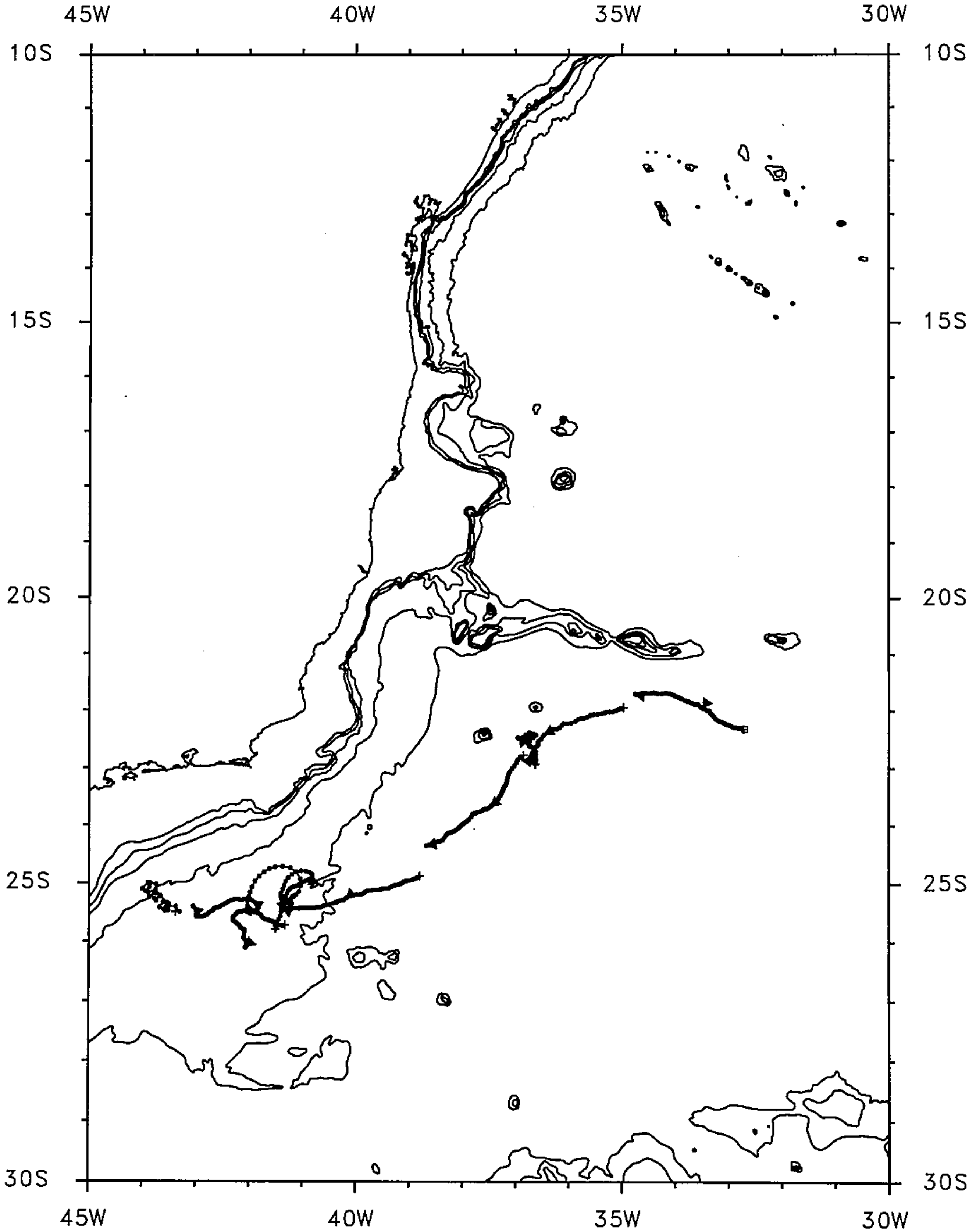
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m110-c1.raw	m110-c1.fin	m110-c1.diaric
m110-c2.raw	m110-c2.fin	m110-c2.diaric
m110-c3.raw	m110-c3.fin	m110-c3.diaric
m110-c4.raw	m110-c4.fin	m110-c4.diaric
m110-c5.raw	m110-c5.fin	m110-c5.diaric
m110-c6.raw	m110-c6.fin	m110-c6.diaric
m110-c7.raw	m110-c7.fin	m110-c7.diaric
m110-c8.raw	m110-c8.fin	m110-c8.diaric
m110-c9.raw	m110-c9.fin	m110-c9.diaric





SAMBA M110 CYCLES 1 TO 9



SAMBA M110 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m110

launch date	launch lat	launch long
1994 2 19 23h UT	22.317 S	32.700 W

file	m110-c1.fin	m110-c2.fin	m110-c3.fin
date of 1st pos	1994 2 21 (16123)	1994 4 24 (16185)	1994 6 25 (16247)
1st pos	32.719W 22.319S	34.975W 21.945S	36.631W 22.931S
last pos	34.756W 21.706S	36.705W 22.782S	36.961W 22.476S
1st P and T	801dbar 4.60degC	784dbar 4.64degC	791dbar 4.96degC
last P and T	815dbar 4.42degC	797dbar 4.75degC	802dbar 4.74degC
displacements (East and North)	-210km 68km	-178km -93km	-34km 51km
mean velocities (East and North)	-4.12cm/s 1.34cm/s	-3.49cm/s -1.82cm/s	-0.66cm/s 0.99cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -2.76 cm/s [-4.16, -1.35]
average north velocity comp.= 0.18 cm/s [-0.91, 1.28]

variances
variance of east velocity comp.= 8.08 cm2/s2 [2.80, 13.36]
variance of north velocity comp.= 4.89 cm2/s2 [1.69, 8.08]

covariance
covariance= 1.35 cm2/s2 [-1.56, 4.25]

Eddy Kinetic Energy
EKE= 6.49 cm2/s2 [3.40, 9.57]

Temperature time series statistics:

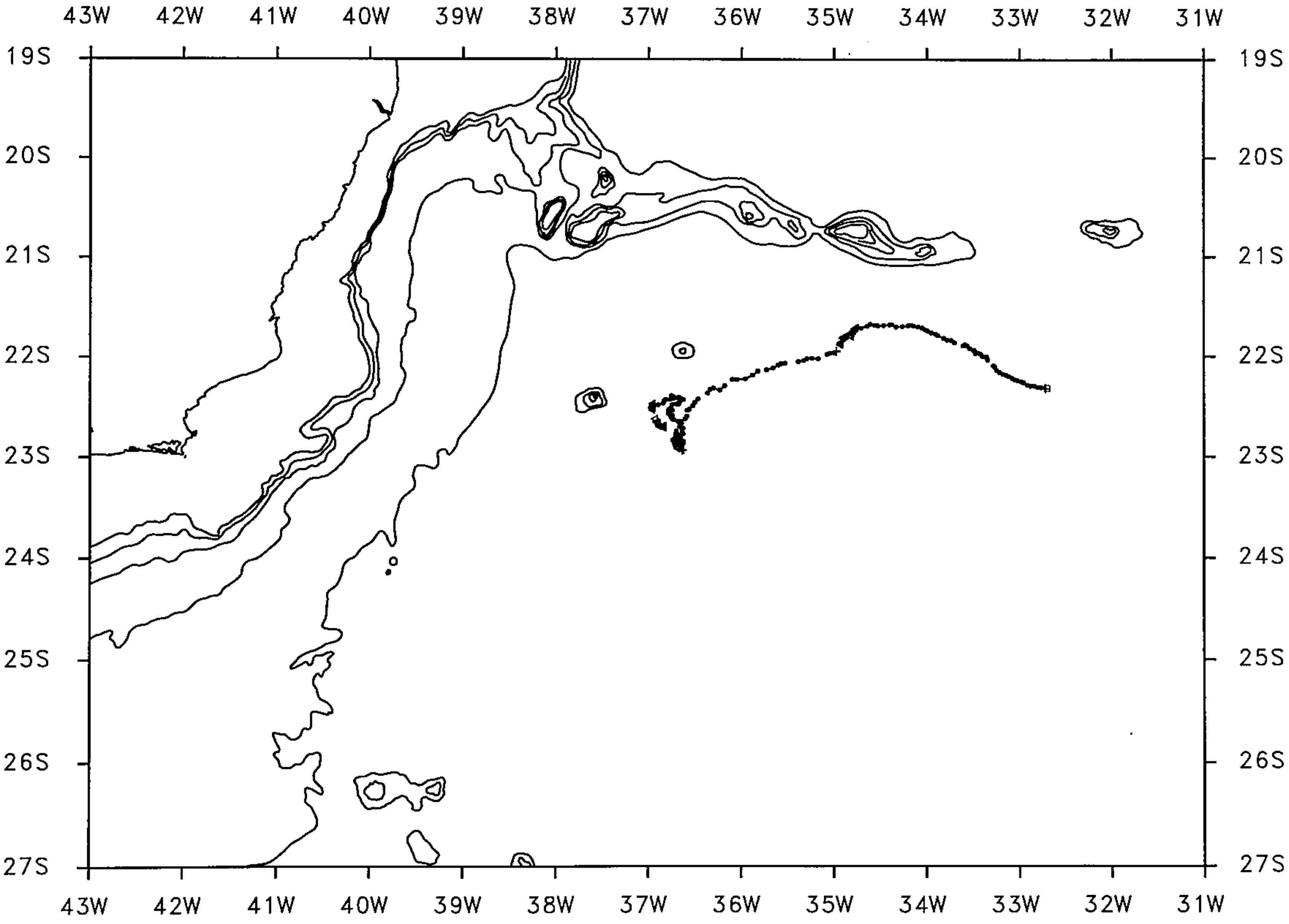
sampling interval= 24 h
number of samples= 164

average temperature= 4.66 degC

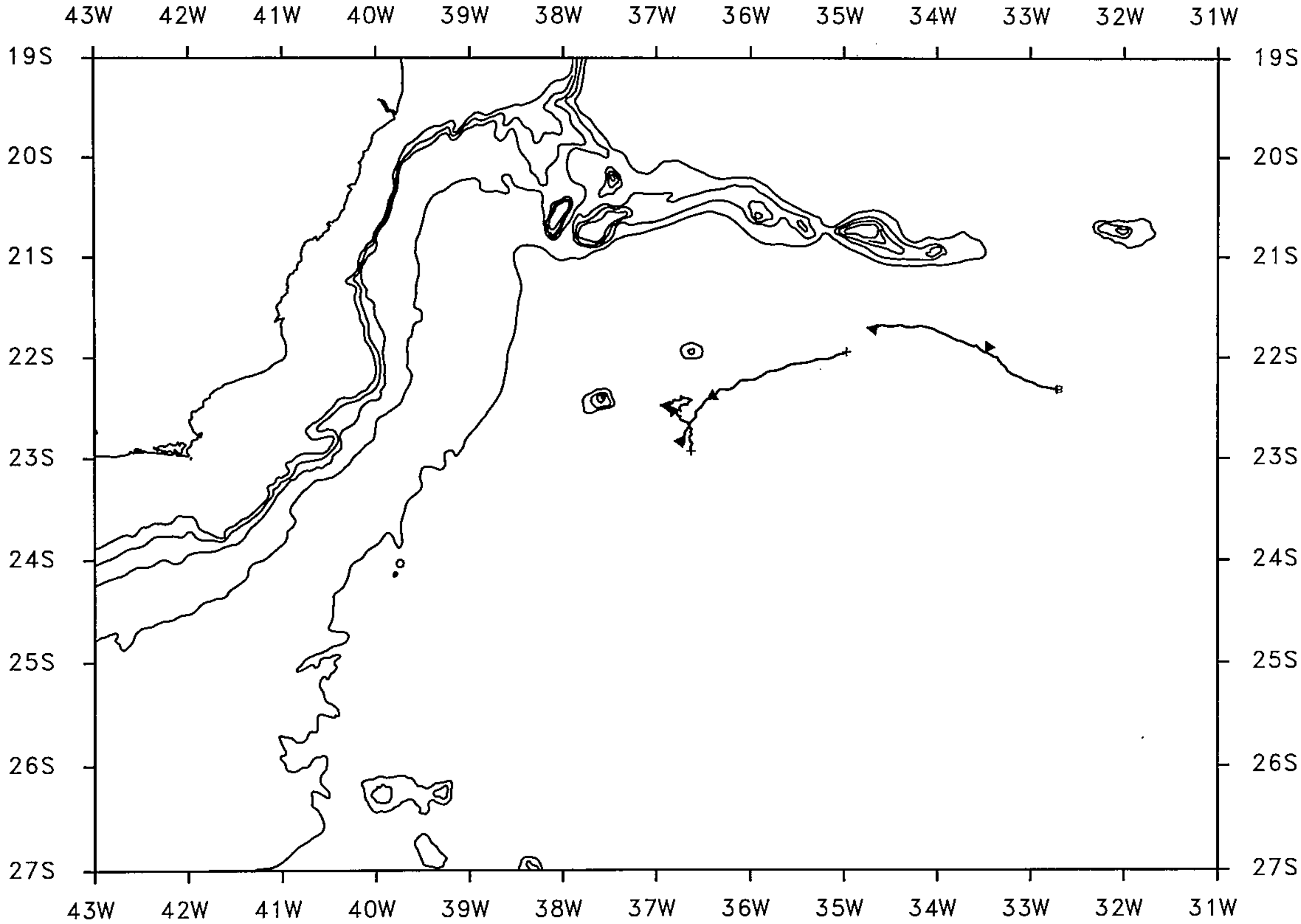
temperature variance= 0.0285 degC*degC

covar(u,temp)= 0.24 cm.degC/s
covar(v,temp)= 0.02 cm.degC/s

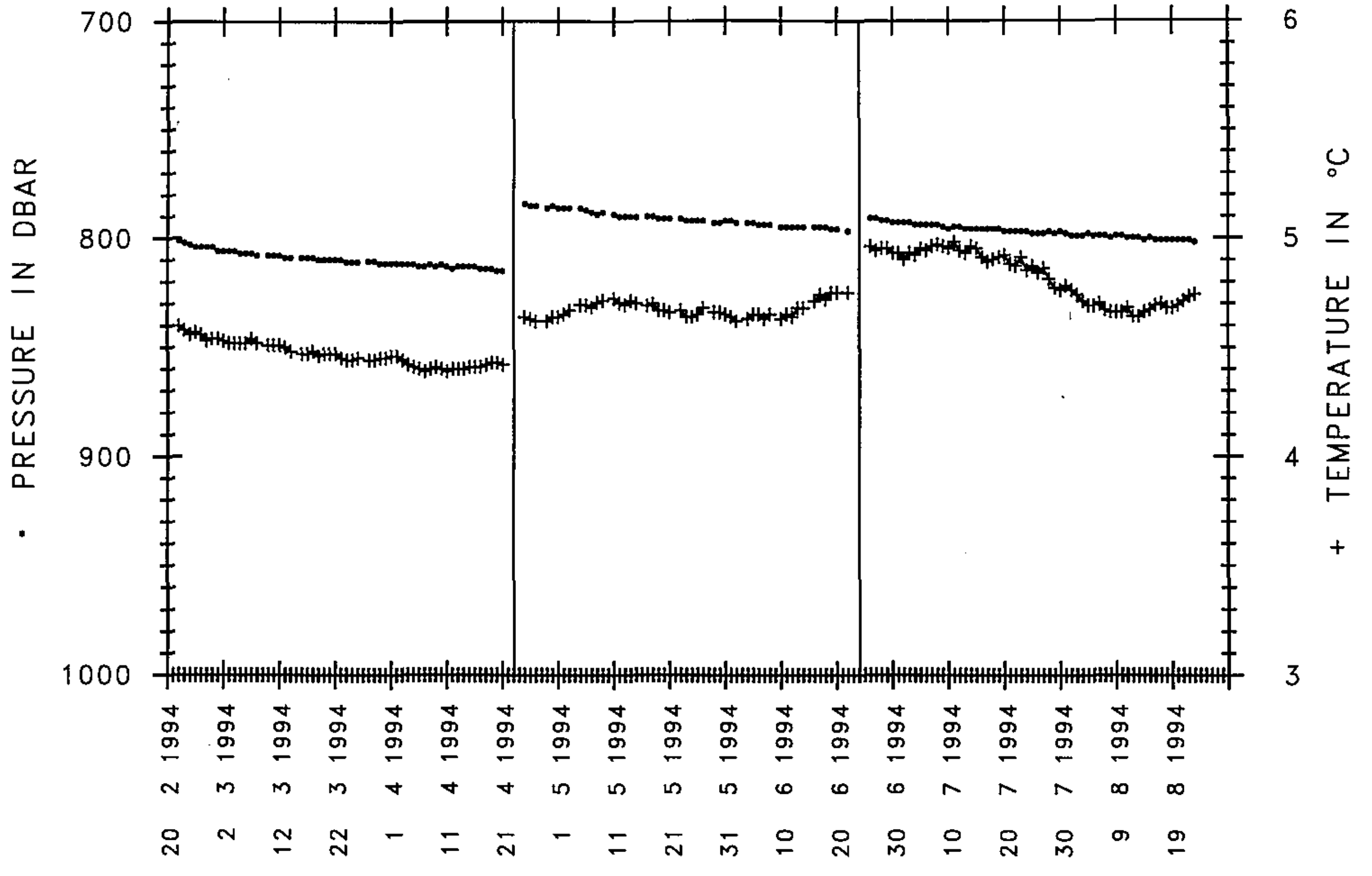
Comments:

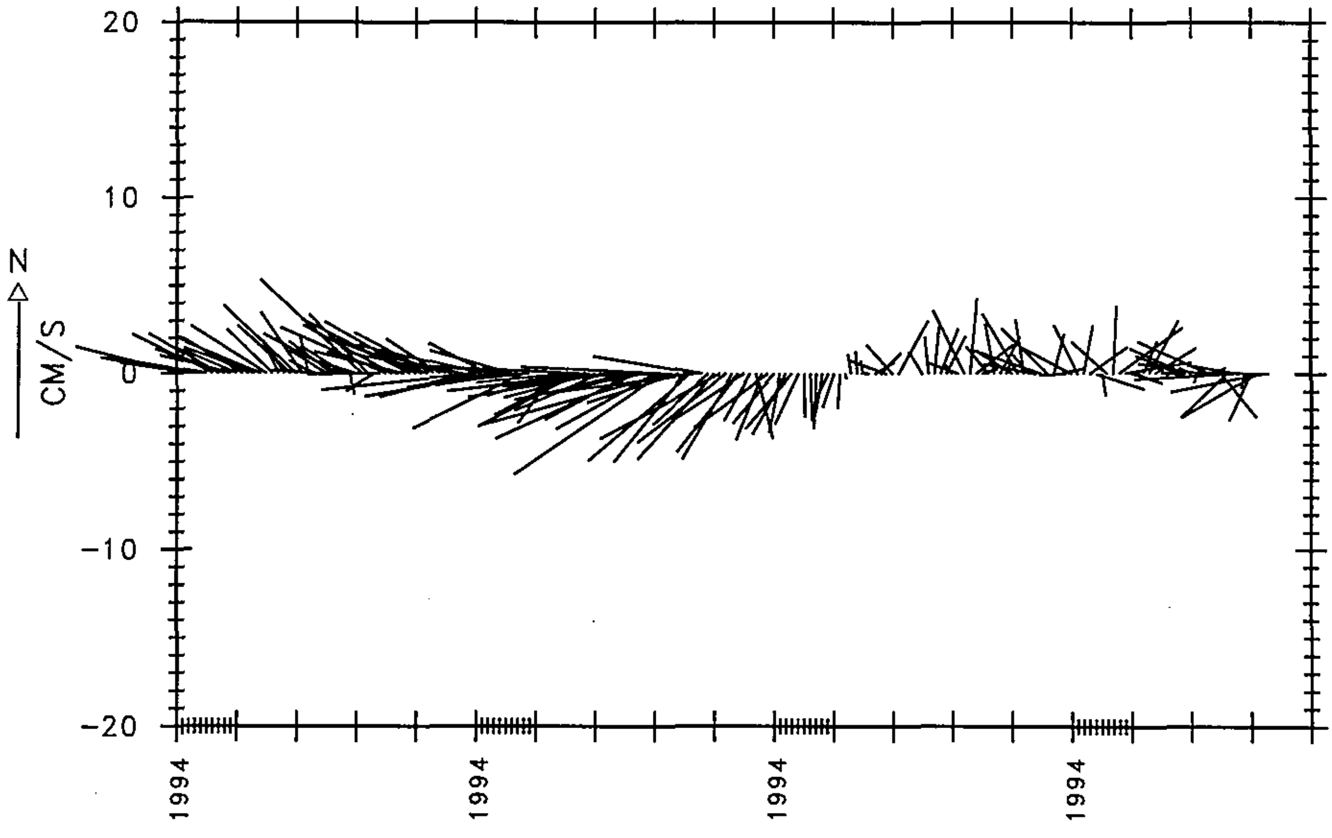


SAMBA M110 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M110 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED





SAMBA M110 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m110

launch date	launch lat	launch long
1994 2 19 23h UT	22.317 S	32.700 W

file	m110-c4.fin	m110-c5.fin	m110-c6.fin
date of 1st pos	1994 8 26 (16309)	1994 10 27 (16371)	1994 12 28 (16433)
1st pos	36.856W 22.775S	38.802W 24.869S	41.326W 25.719S
last pos	38.677W 24.351S	41.379W 25.439S	42.066W 26.104S
1st P and T	790dbar 4.86degC	803dbar 4.92degC	793dbar 5.02degC
last P and T	805dbar 4.94degC	832dbar 4.78degC	806dbar 5.30degC
displacements (East and North)	-185km -175km	-259km -63km	-74km -43km
mean velocities (East and North)	-3.64cm/s -3.44cm/s	-5.08cm/s -1.24cm/s	-1.45cm/s -0.84cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.41 cm/s [-4.66, -2.15]
average north velocity comp.= -1.84 cm/s [-2.87, -0.81]

variances
variance of east velocity comp.= 6.41 cm2/s2 [2.22, 10.60]
variance of north velocity comp.= 4.35 cm2/s2 [1.51, 7.19]

covariance
covariance= -0.66 cm2/s2 [-3.09, 1.78]

Eddy Kinetic Energy
EKE= 5.38 cm2/s2 [2.85, 7.91]

Temperature time series statistics:

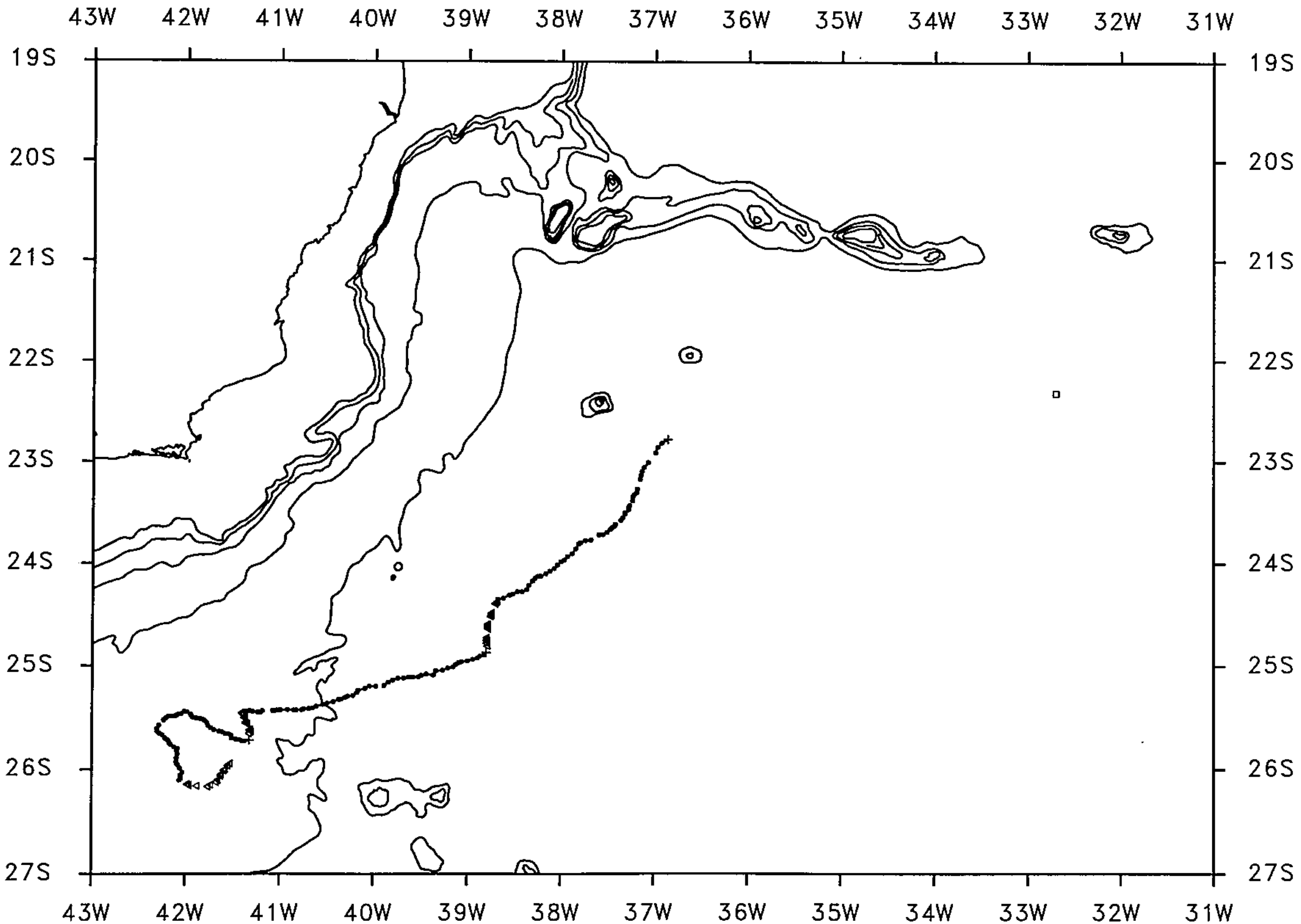
sampling interval= 24 h
number of samples= 169

average temperature= 4.94 degC

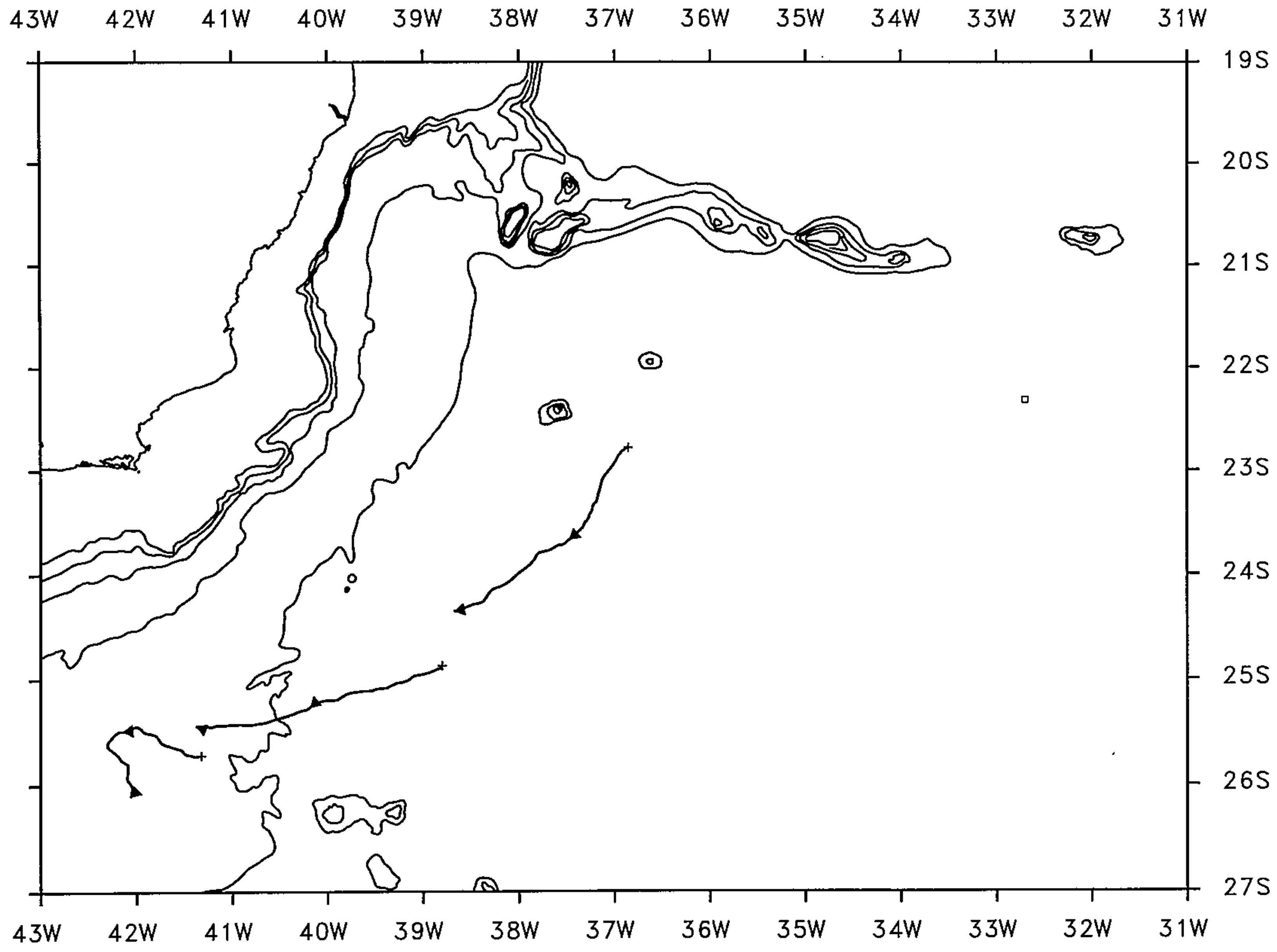
temperature variance= 0.0374 degC*degC

covar(u,temp)= 0.19 cm.degC/s
covar(v,temp)= 0.12 cm.degC/s

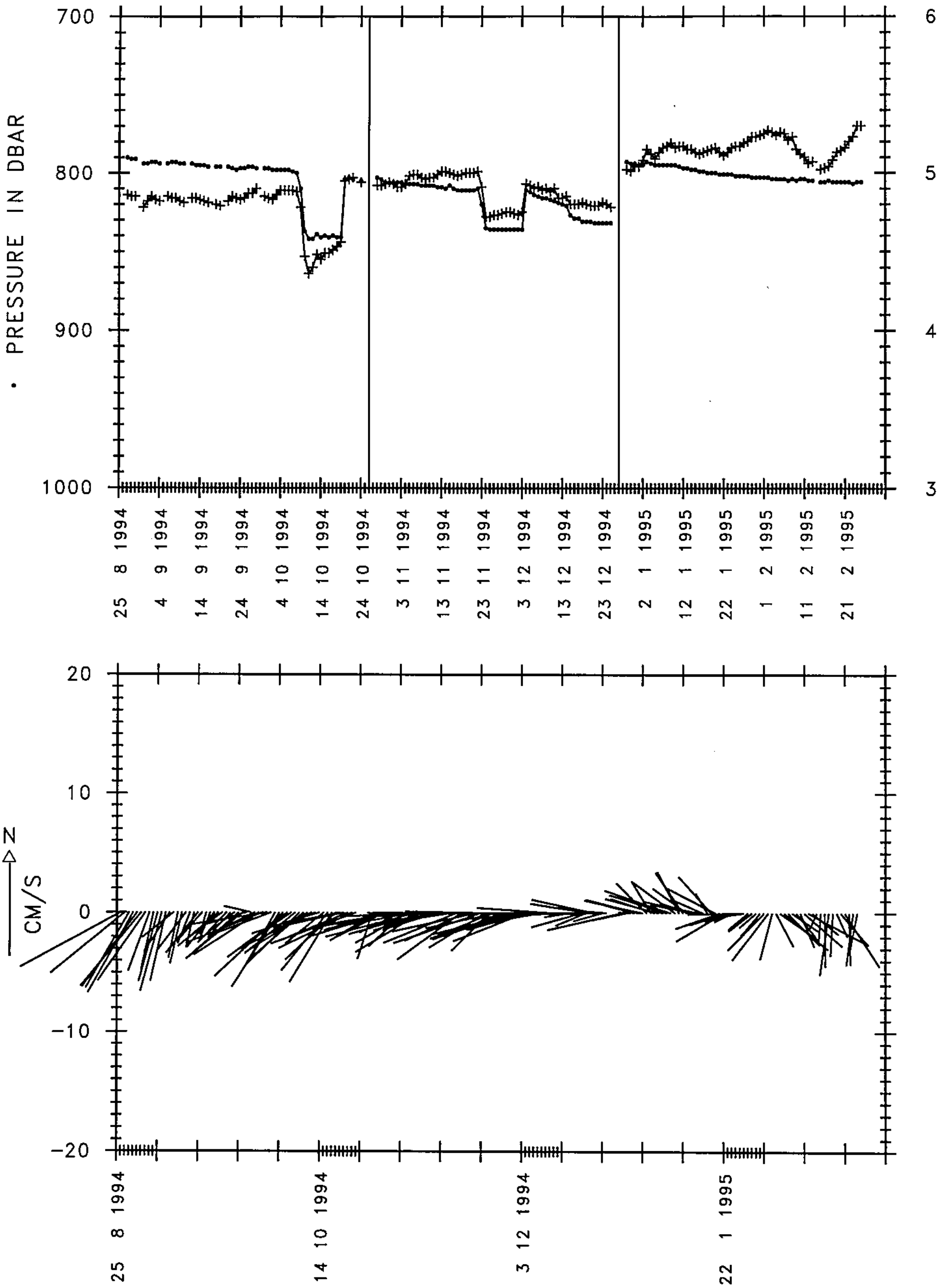
Comments:



SAMBA M110 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M110 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M110 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m110

launch date	launch lat	launch long
1994 2 19 23h UT	22.317 S	32.700 W

file	m110-c7.fin	m110-c8.fin	m110-c9.fin
date of 1st pos	1995 2 28 (16495)	1995 5 1 (16557)	1995 7 2 (16619)
1st pos	41.500W 25.786S	41.207W 25.259S	43.374W 25.493S
last pos	41.275W 25.308S	43.046W 25.403S	43.861W 25.007S
1st P and T	819dbar 5.24degC	816dbar 5.03degC	805dbar 5.21degC
last P and T	2632dbar 2.99degC	1270dbar 3.31degC	1928dbar 3.80degC
displacements (East and North)	23km 53km	-185km -16km	-49km 54km
mean velocities (East and North)	0.44cm/s 1.04cm/s	-3.62cm/s -0.31cm/s	-1.77cm/s 1.95cm/s
number of pos	60	60	27

Velocity time series statistics:

sampling interval= 24 h
number of samples= 45

5 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -3.62 cm/s [-13.41, 6.17]
average north velocity comp.= 1.45 cm/s [-8.16, 11.06]

variances
variance of east velocity comp.= 72.56 cm2/s2 [-17.39, 162.50]
variance of north velocity comp.= 69.91 cm2/s2 [-16.75, 156.58]

covariance
covariance= 17.17 cm2/s2 [-45.26, 79.60]

Eddy Kinetic Energy
EKE= 71.23 cm2/s2 [8.78, 133.68]

Temperature time series statistics:

sampling interval= 24 h
number of samples= 41

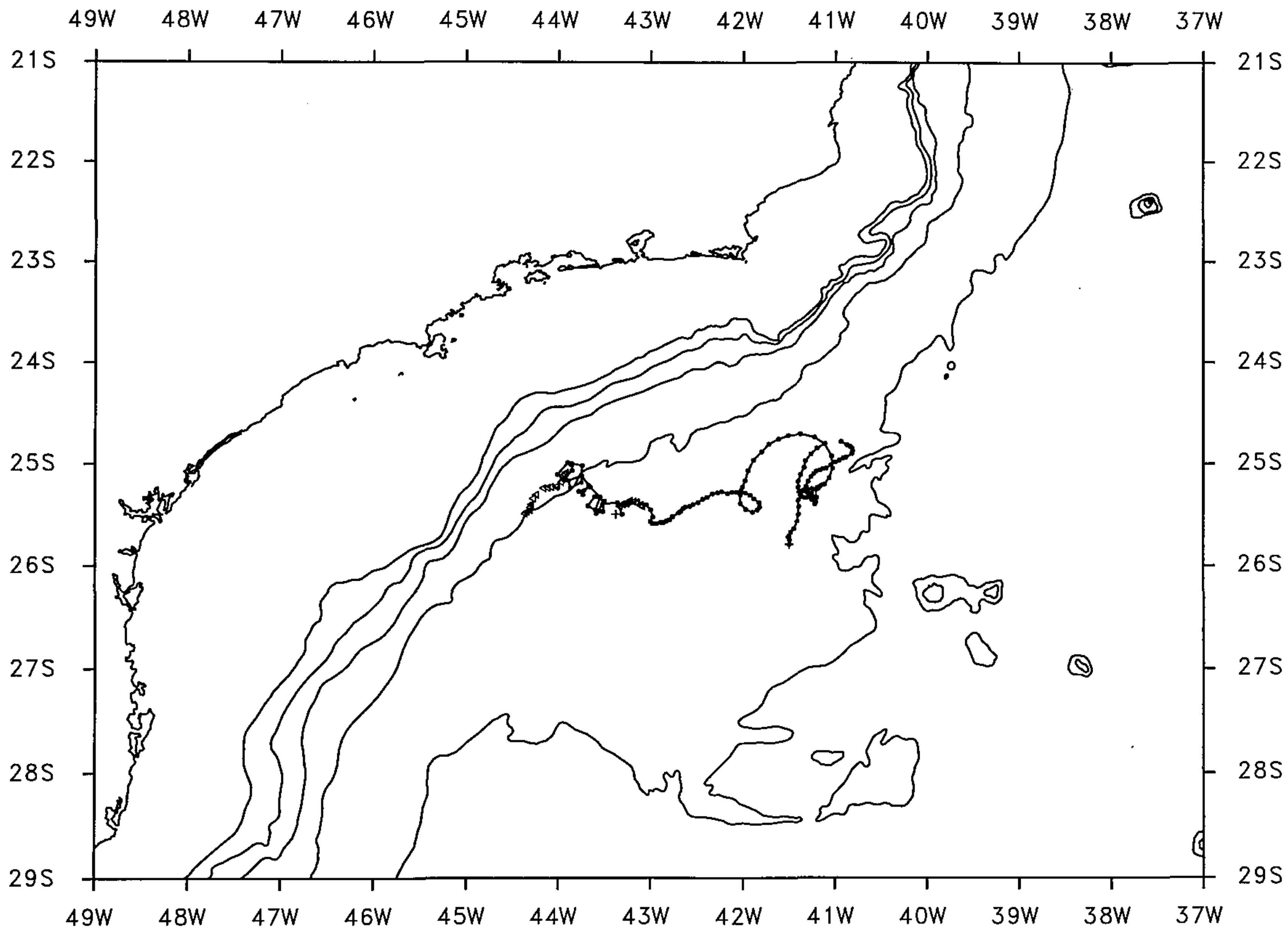
average temperature= 4.79 degC

temperature variance= 0.0684 degC*degC

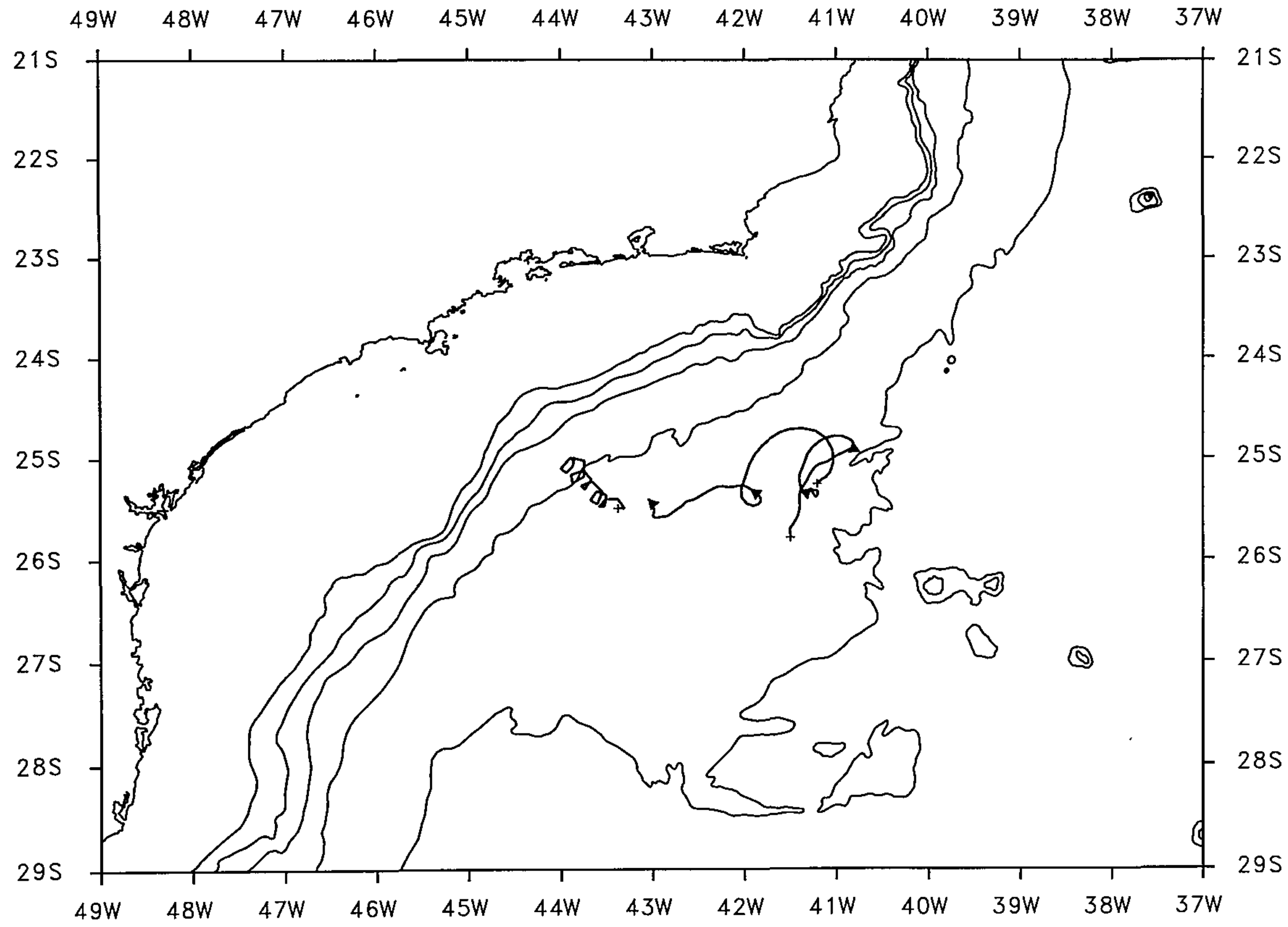
covar(u,temp)= 0.45 cm.degC/s
covar(v,temp)= 0.73 cm.degC/s

Comments:

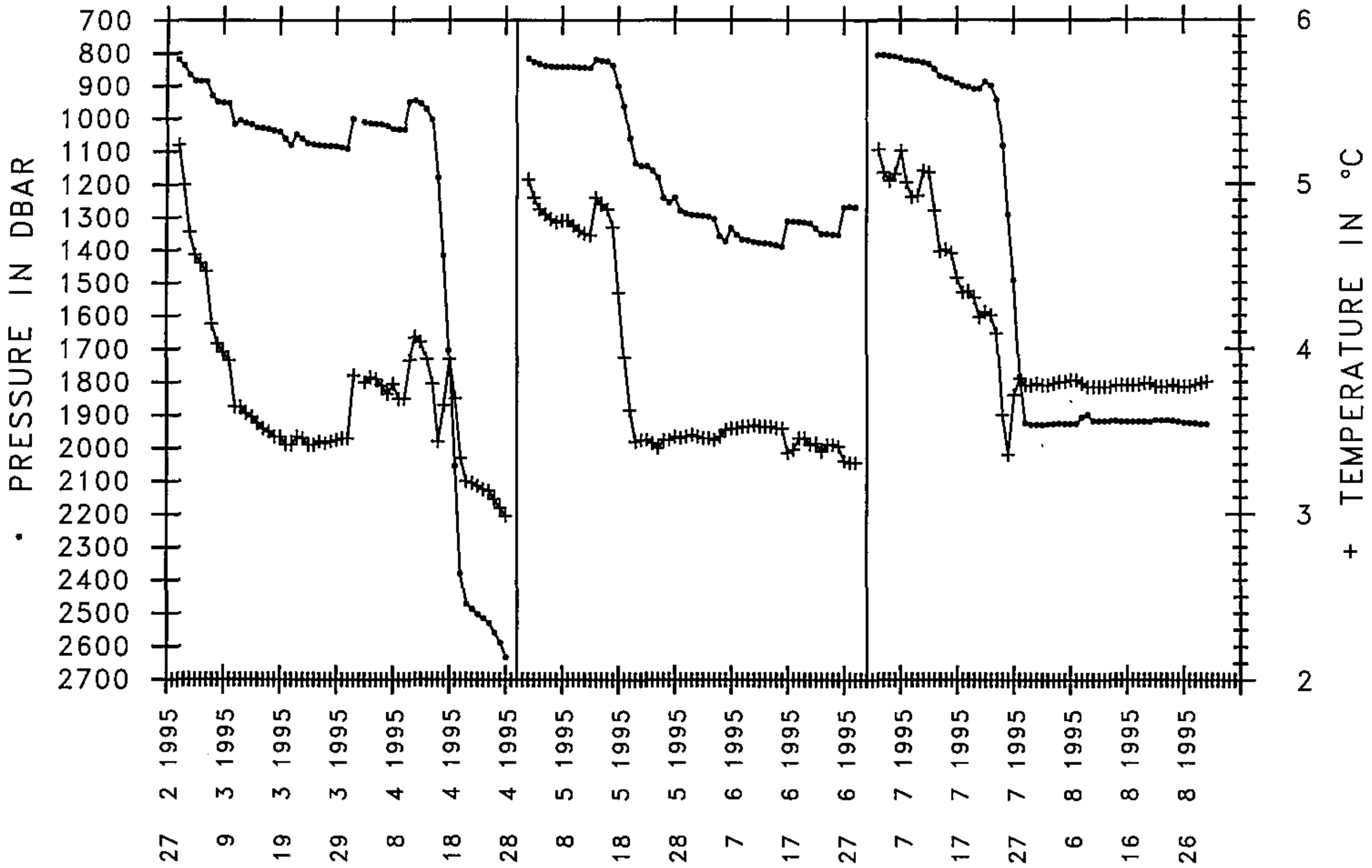
Velocity and temperature time series statistics are estimated from data within the [700,900] dbar interval.

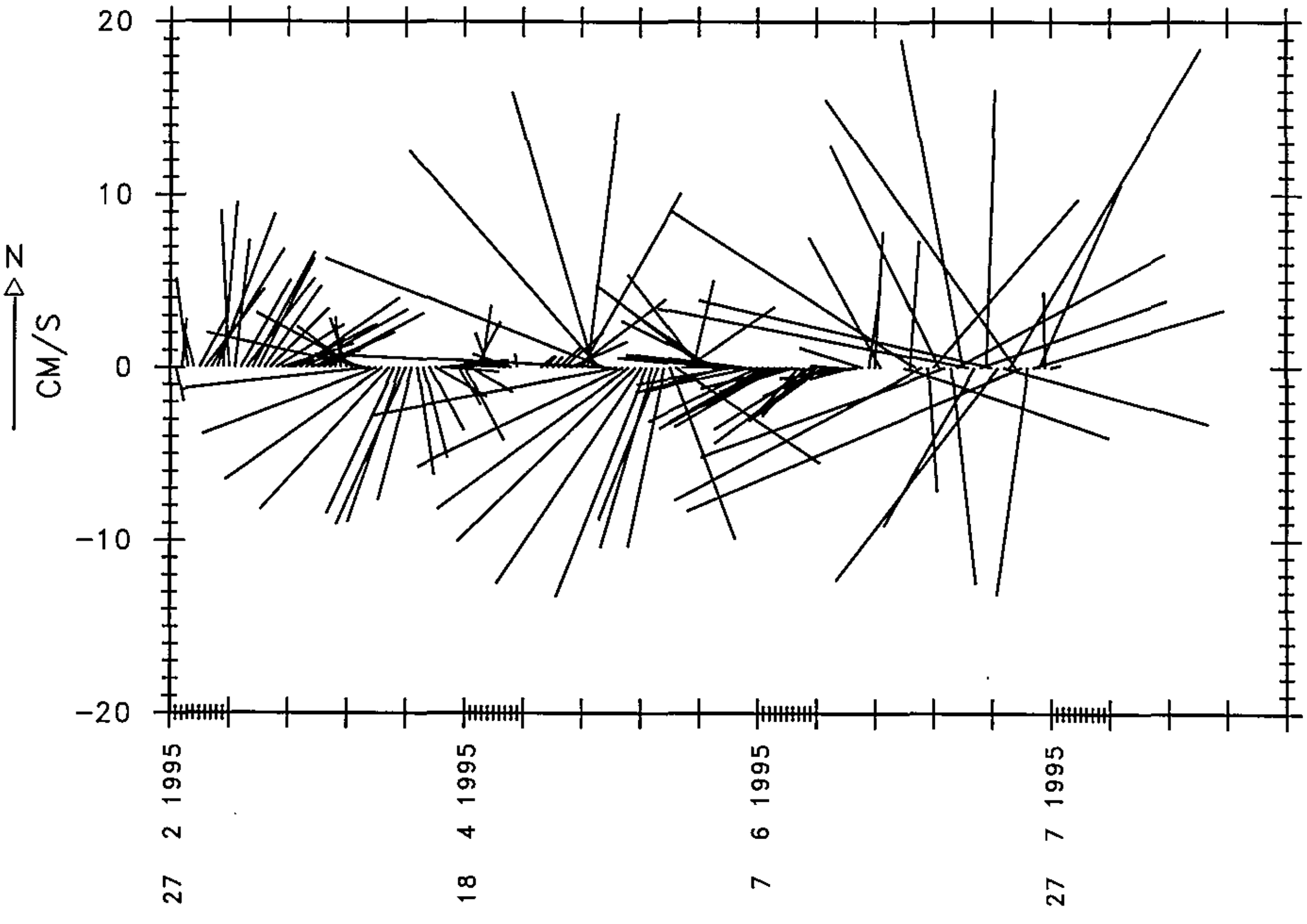


SAMBA M110 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M110 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M110 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #111

LAUNCHED AT: 18°43.5'S 31°20.0'W on 20/02/1994 21h11 UT

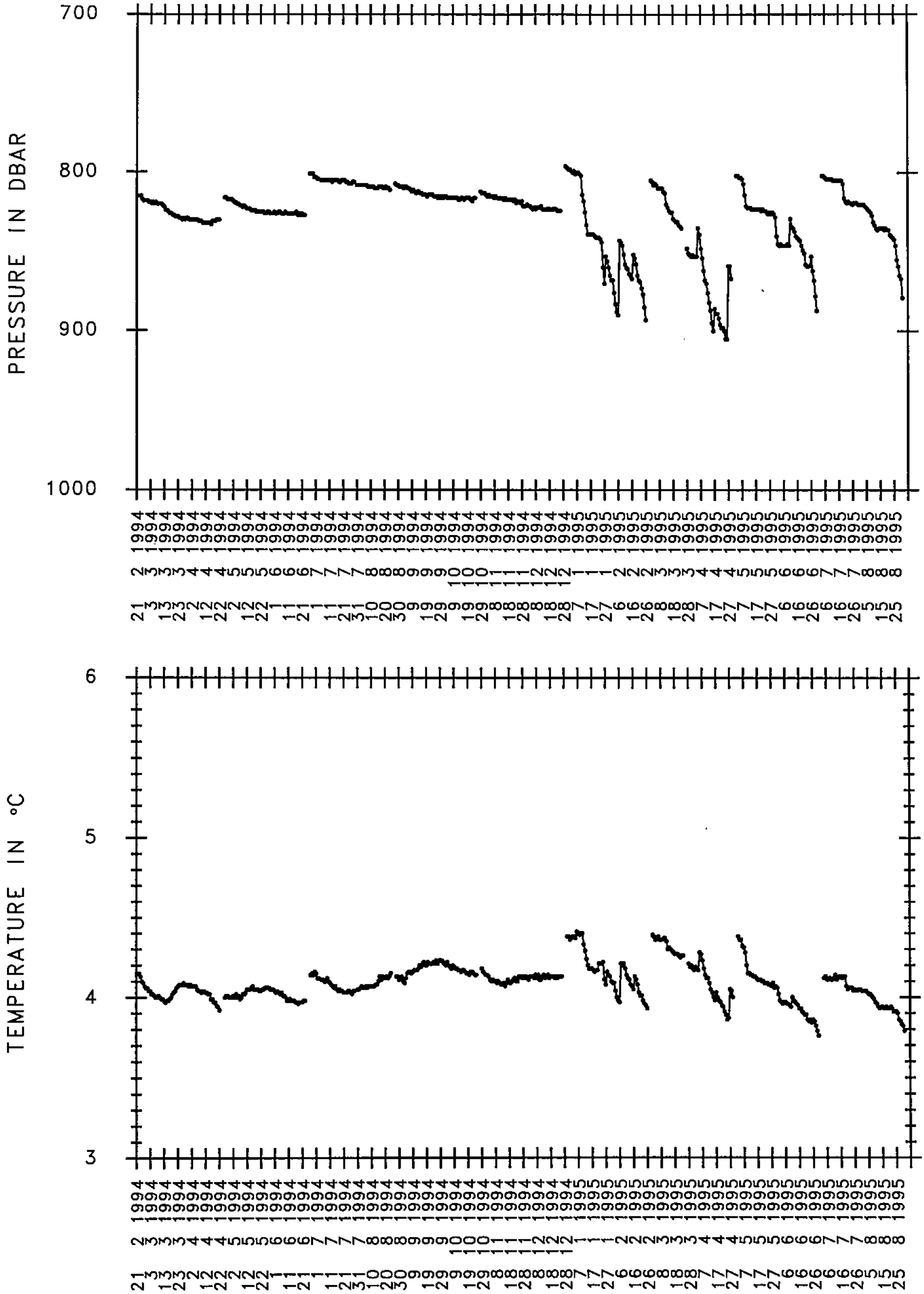
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

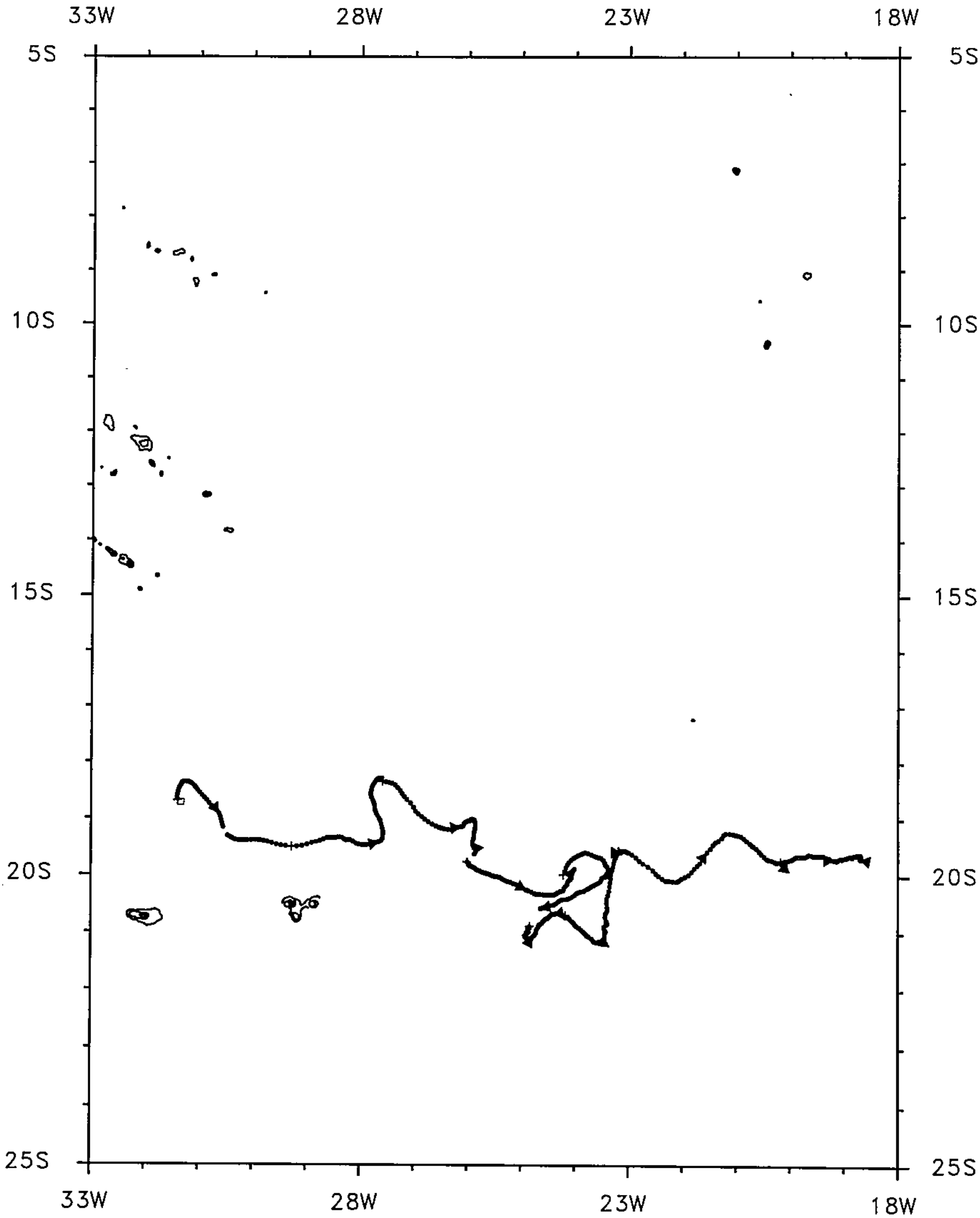
This float reveals an overall eastward flow over 1.5 year.
Although the float hydraulics slightly malfunctioned during the four last cycles, pressure didn't exceed 900 dbar.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m111-c1.raw	m111-c1.fin	m111-c1.diaric
m111-c2.raw	m111-c2.fin	m111-c2.diaric
m111-c3.raw	m111-c3.fin	m111-c3.diaric
m111-c4.raw	m111-c4.fin	m111-c4.diaric
m111-c5.raw	m111-c5.fin	m111-c5.diaric
m111-c6.raw	m111-c6.fin	m111-c6.diaric
m111-c7.raw	m111-c7.fin	m111-c7.diaric
m111-c8.raw	m111-c8.fin	m111-c8.diaric
m111-c9.raw	m111-c9.fin	m111-c9.diaric



SAMBA M111 CYCLES 1 TO 9



SAMBA M111 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m111

launch date	launch lat	launch long
1994 2 20 21h UT	18.725 S	31.333 W

file	m111-c1.fin	m111-c2.fin	m111-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 25 (16186)	1994 6 28 (16250)
1st pos	31.392W 18.690S	29.276W 19.496S	27.588W 18.343S
last pos	29.387W 19.487S	27.599W 18.286S	25.875W 19.619S
1st P and T	815dbar 4.15degC	816dbar 4.00degC	801dbar 4.14degC
last P and T	830dbar 3.92degC	827dbar 3.98degC	811dbar 4.15degC
displacements (East and North)	211km -89km	176km 134km	180km -142km
mean velocities (East and North)	4.20cm/s -1.77cm/s	3.52cm/s 2.68cm/s	3.65cm/s -2.88cm/s
number of pos	54	59	58

Velocity time series statistics:

sampling interval= 24 h
number of samples= 171

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 3.88 cm/s [2.08, 5.67]
average north velocity comp.= -0.56 cm/s [-2.68, 1.55]

variances
variance of east velocity comp.= 12.33 cm2/s2 [4.04, 20.62]
variance of north velocity comp.= 17.04 cm2/s2 [5.58, 28.50]

covariance
covariance= -4.34 cm2/s2 [-11.23, 2.55]

Eddy Kinetic Energy
EKE= 14.69 cm2/s2 [7.62, 21.76]

Temperature time series statistics:

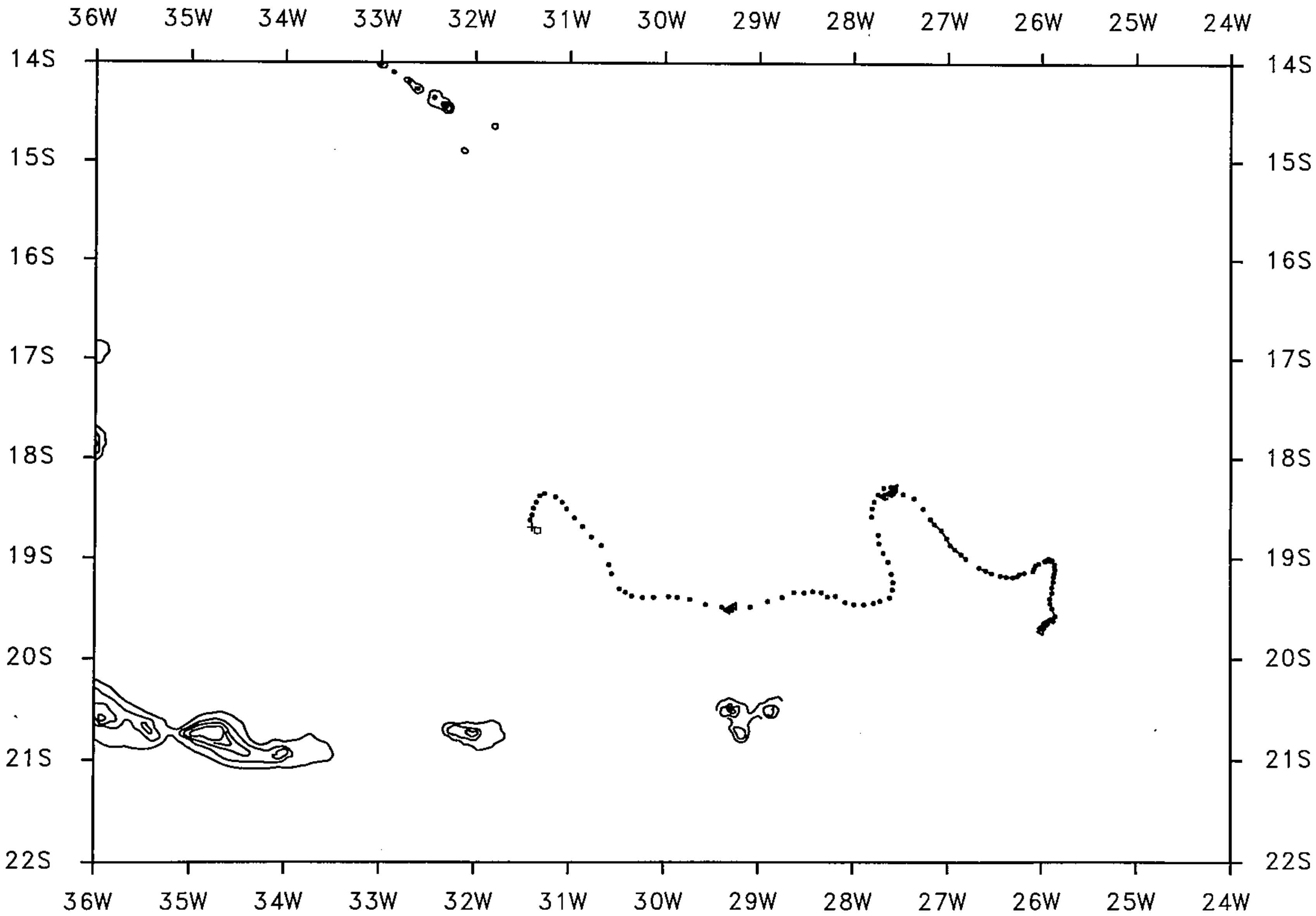
sampling interval= 24 h
number of samples= 167

average temperature= 4.04 degC

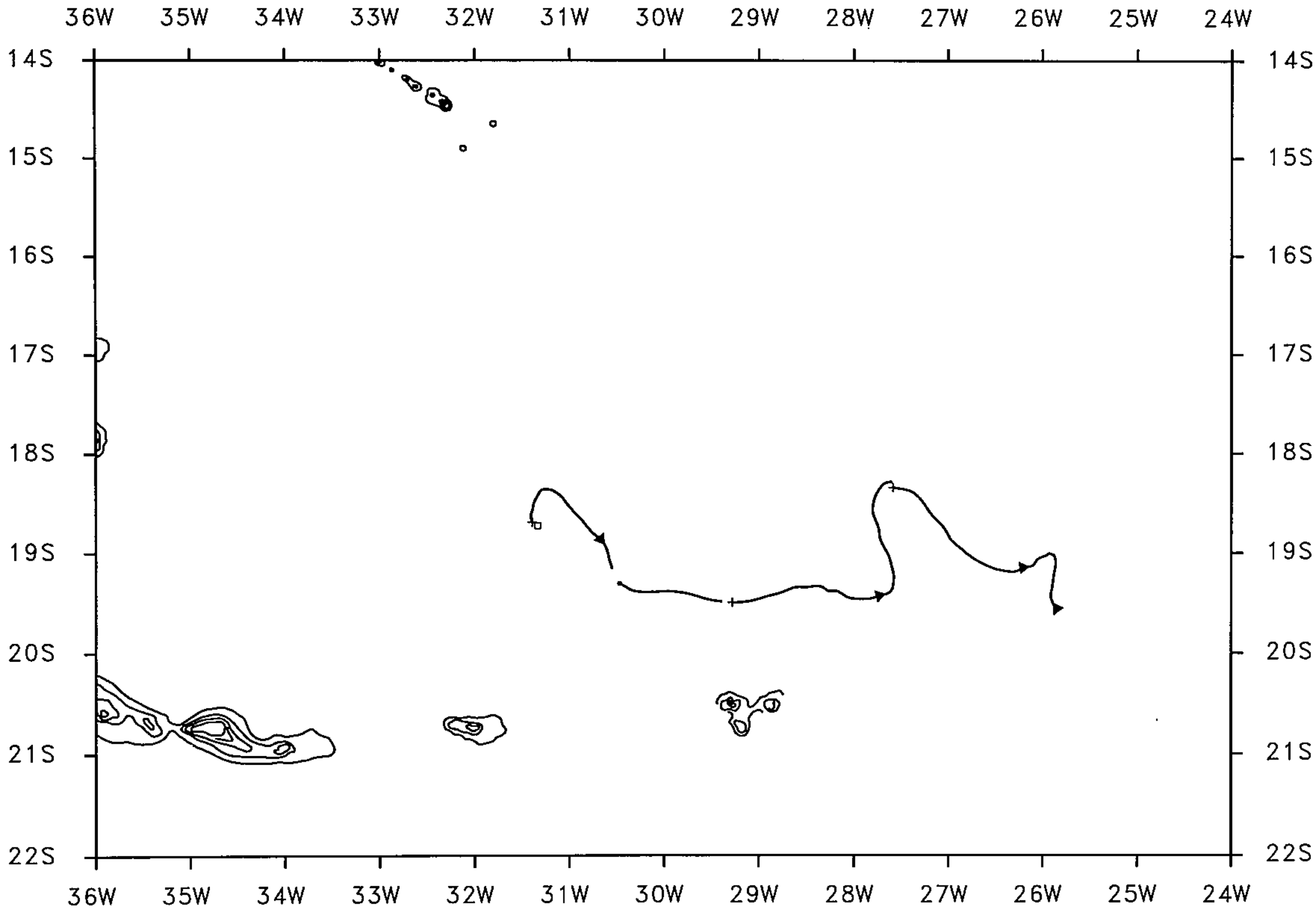
temperature variance= 0.0022 degC*degC

covar(u,temp)= -0.04 cm.degC/s
covar(v,temp)= -0.08 cm.degC/s

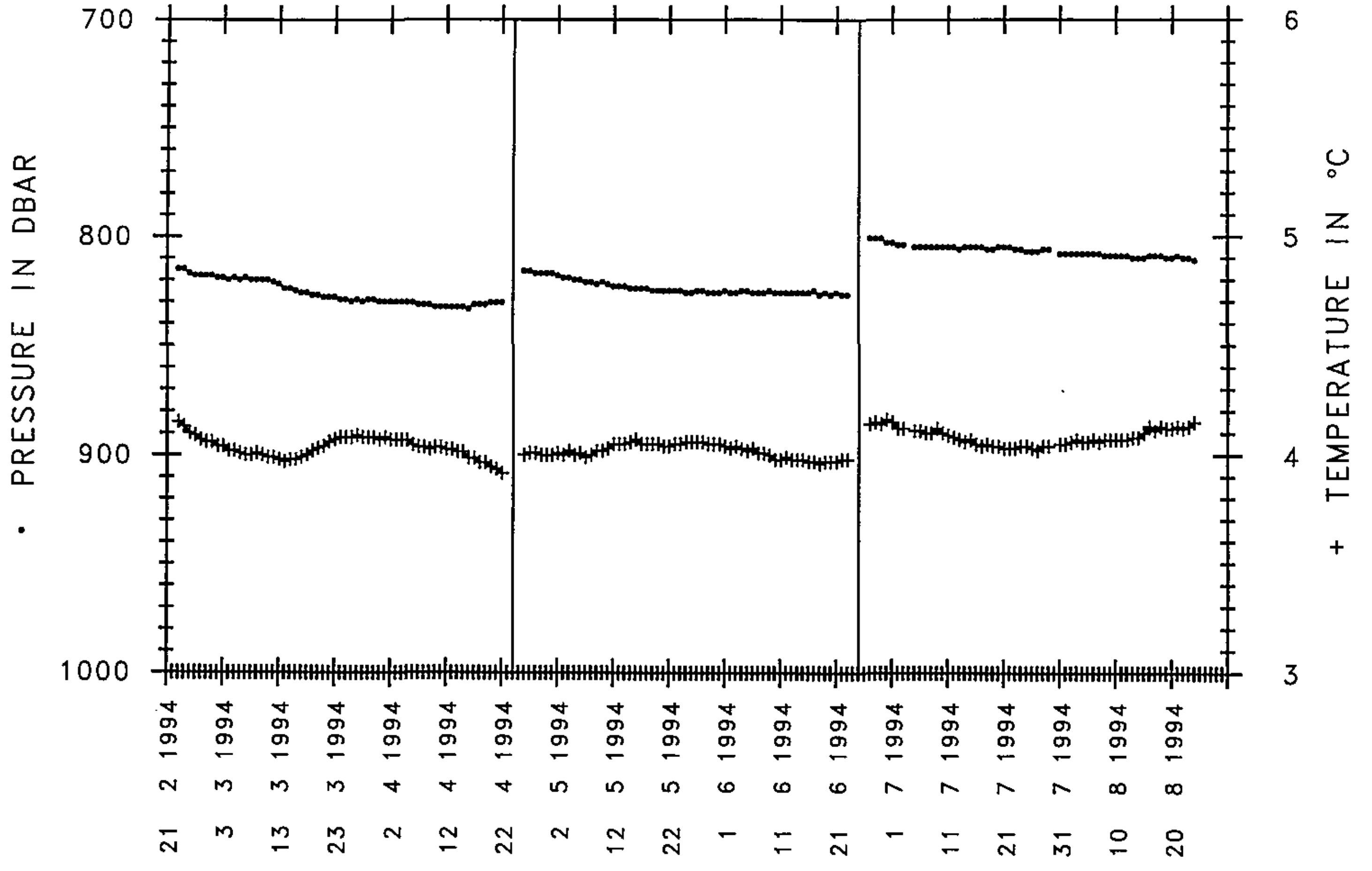
Comments:

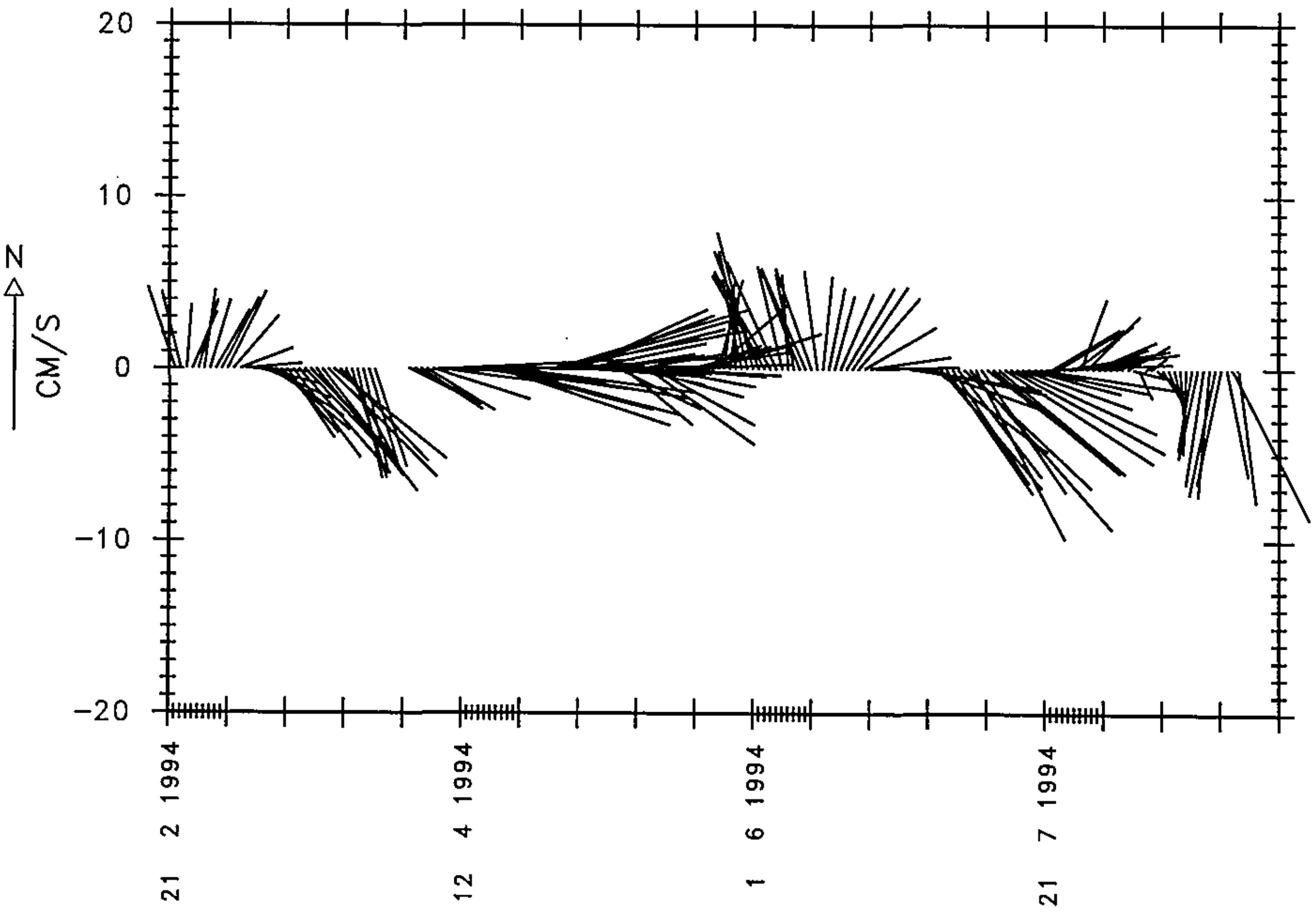


SAMBA M111 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M111 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED





SAMBA M111 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m111

launch date	launch lat	launch long
1994 2 20 21h UT	18.725 S	31.333 W

file	m111-c4.fin	m111-c5.fin	m111-c6.fin
date of 1st pos	1994 8 27 (16310)	1994 10 28 (16372)	1994 12 30 (16435)
1st pos	26.011W 19.757S	24.217W 19.976S	24.840W 20.880S
last pos	24.011W 19.877S	24.640W 20.571S	24.183W 20.728S
1st P and T	807dbar 4.13degC	812dbar 4.18degC	796dbar 4.38degC
last P and T	816dbar 4.14degC	824dbar 4.13degC	893dbar 3.93degC
displacements (East and North)	209km -13km	-44km -66km	68km 17km
mean velocities (East and North)	4.10cm/s -0.26cm/s	-0.86cm/s -1.30cm/s	1.36cm/s 0.34cm/s
number of pos	60	60	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 179

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 1.53 cm/s [-0.28, 3.34]
average north velocity comp.= -0.39 cm/s [-1.80, 1.01]

variances
variance of east velocity comp.= 13.38 cm2/s2 [4.64, 22.11]
variance of north velocity comp.= 8.02 cm2/s2 [2.78, 13.27]

covariance
covariance= 1.79 cm2/s2 [-3.00, 6.57]

Eddy Kinetic Energy
EKE= 10.70 cm2/s2 [5.60, 15.79]

Temperature time series statistics:

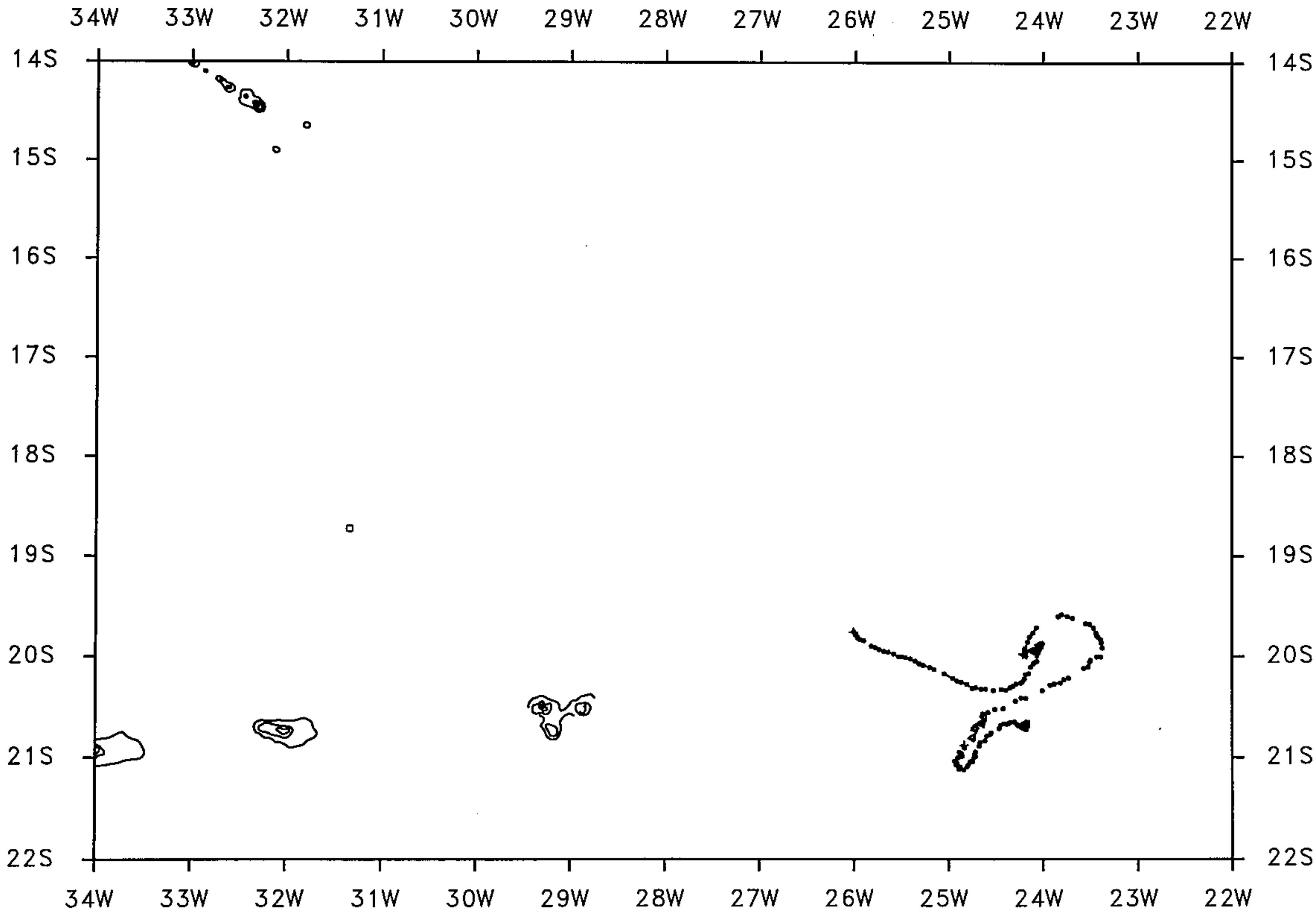
sampling interval= 24 h
number of samples= 177

average temperature= 4.16 degC

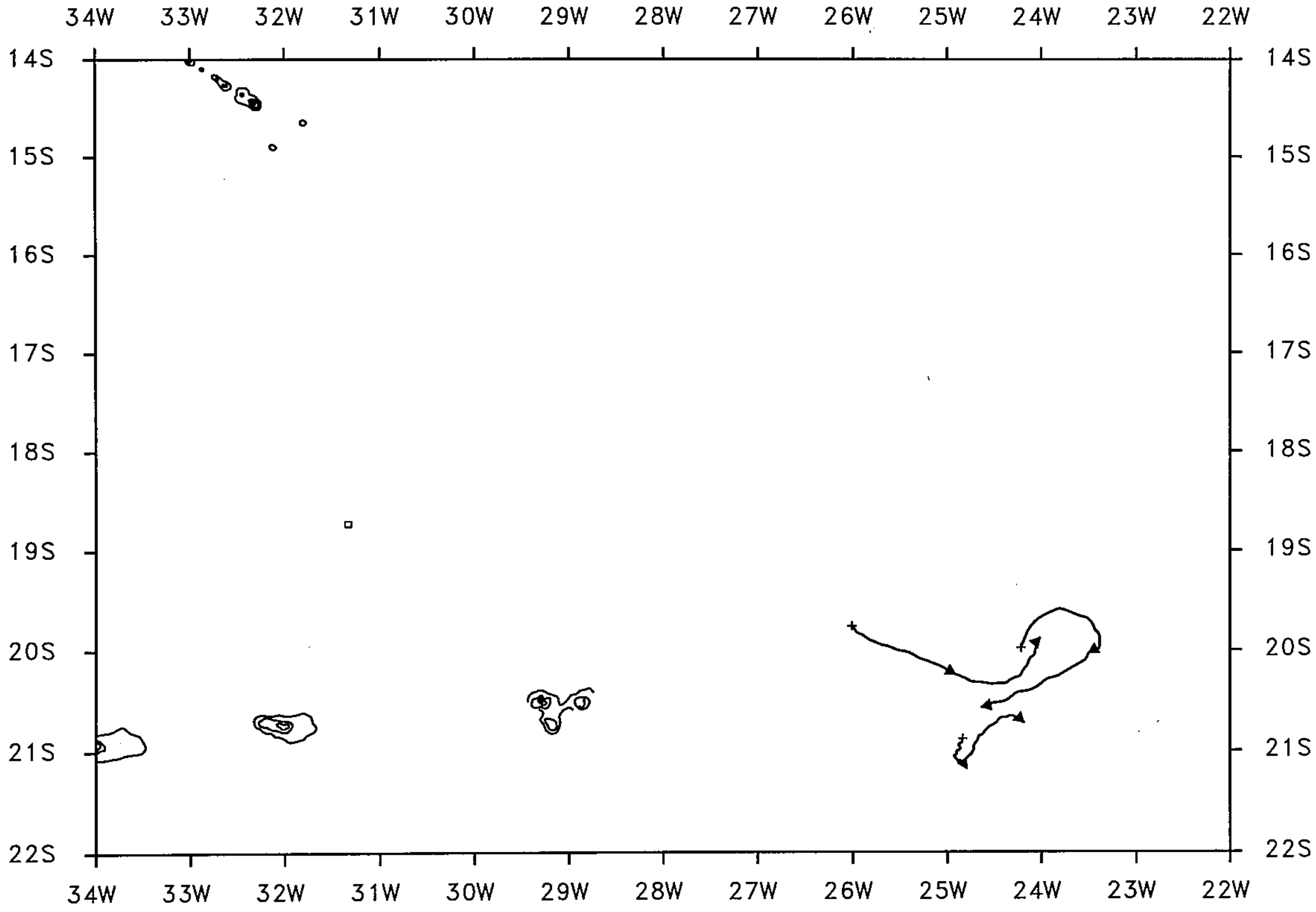
temperature variance= 0.0074 degC*degC

covar(u,temp)= -0.01 cm.degC/s
covar(v,temp)= -0.02 cm.degC/s

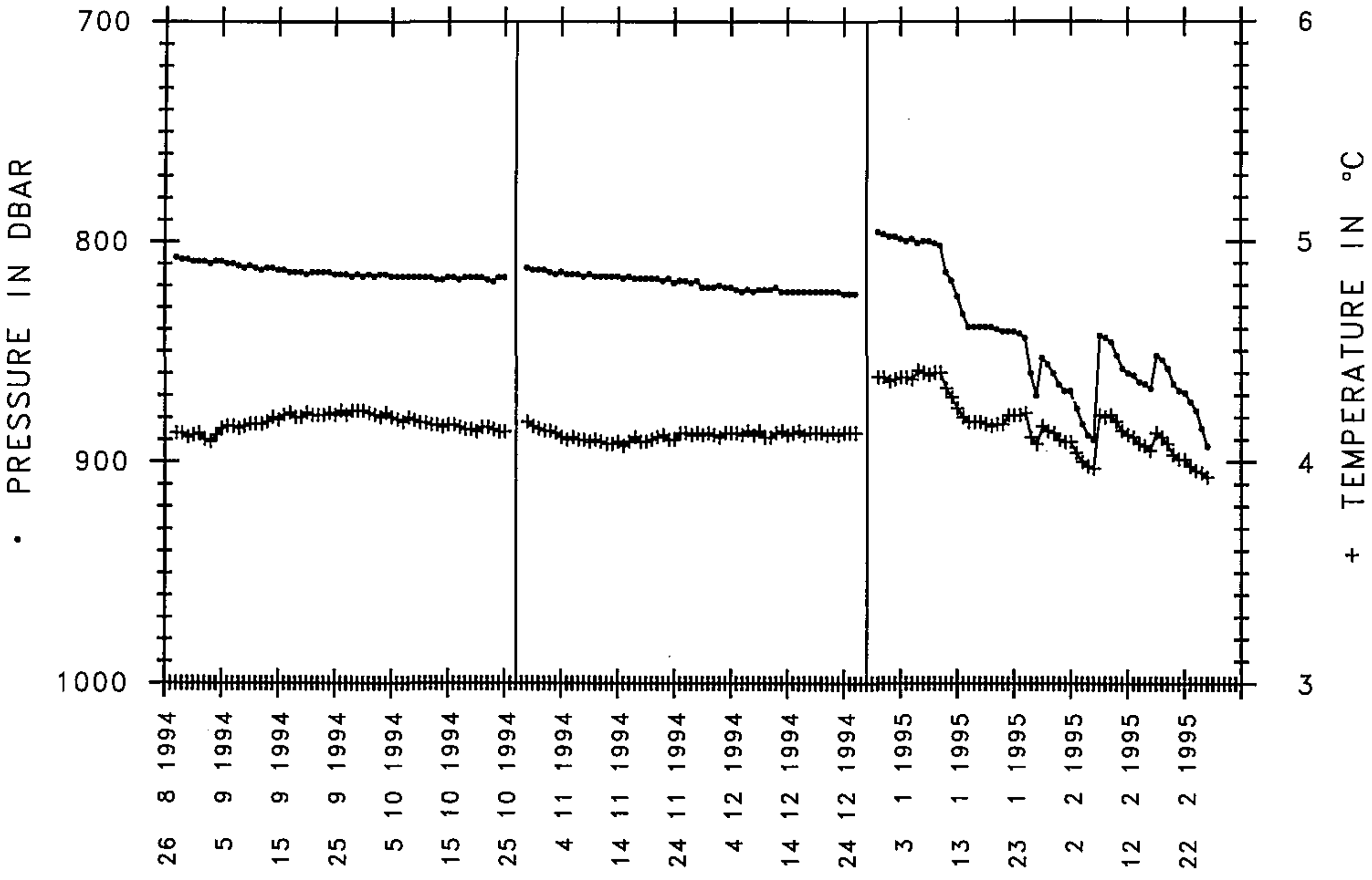
Comments:

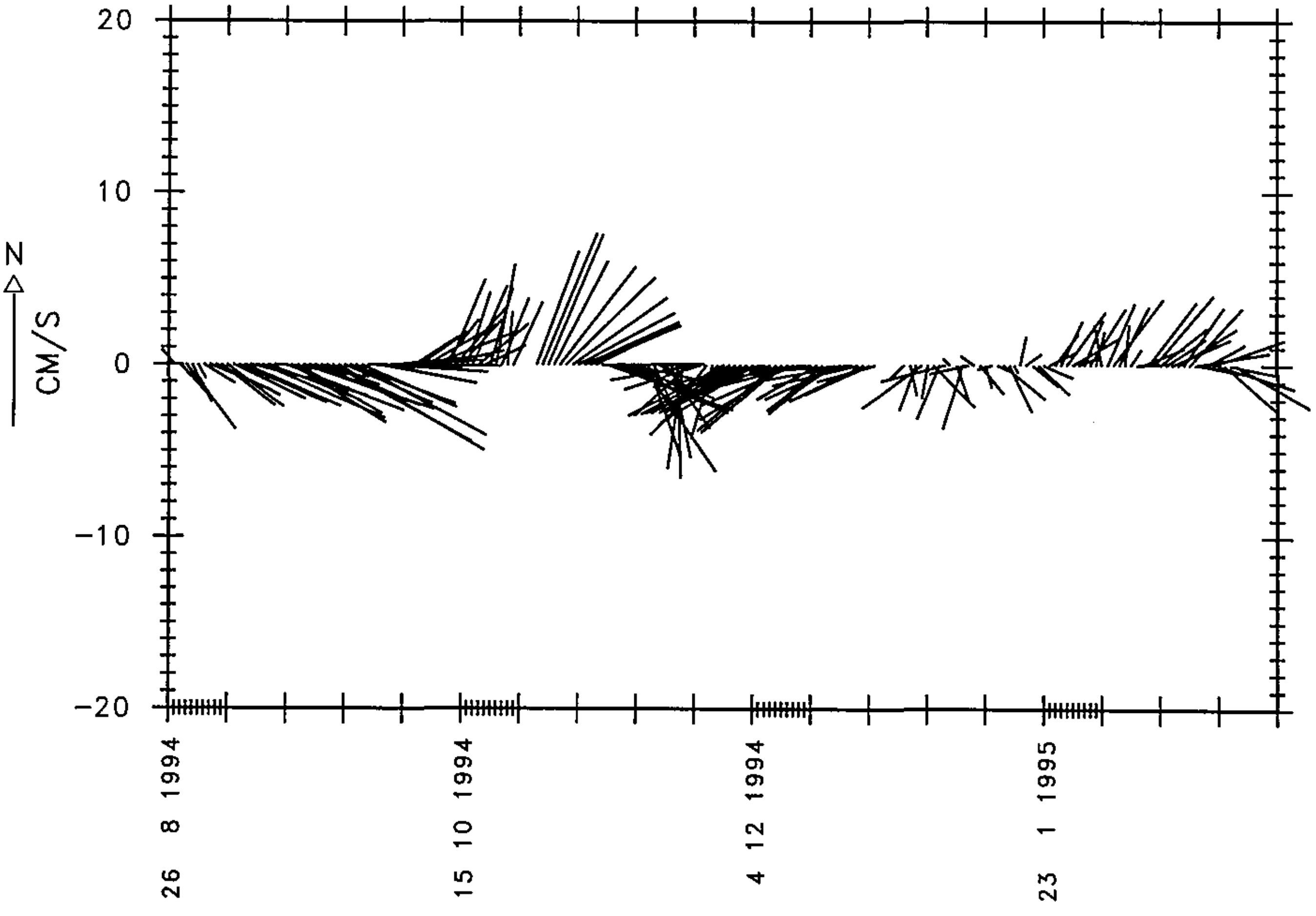


SAMBA M111 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M111 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED





SAMBA M111 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m111
----

launch date	launch lat	launch long
1994 2 20 21h UT	18.725 S	31.333 W

file	m111-c7.fin	m111-c8.fin	m111-c9.fin
date of 1st pos	1995 3 1 (16496)	1995 5 2 (16558)	1995 7 3 (16620)
1st pos	24.177W 20.689S	23.193W 19.557S	20.171W 19.736S
last pos	23.142W 19.578S	20.080W 19.733S	18.702W 19.688S
1st P and T	805dbar 4.39degC	802dbar 4.38degC	802dbar 4.12degC
last P and T	867dbar 4.00degC	887dbar 3.76degC	879dbar 3.79degC
displacements (East and North)	108km 123km	326km -20km	154km 5km
mean velocities (East and North)	2.12cm/s 2.42cm/s	6.39cm/s -0.38cm/s	3.01cm/s 0.10cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 3.79 cm/s [2.48, 5.09]
average north velocity comp.= 0.71 cm/s [-1.40, 2.82]

variances
variance of east velocity comp.= 6.92 cm2/s2 [2.40, 11.44]
variance of north velocity comp.= 18.14 cm2/s2 [6.29, 30.00]

covariance
covariance= -4.05 cm2/s2 [-9.23, 1.13]

Eddy Kinetic Energy
EKE= 12.53 cm2/s2 [6.19, 18.87]

Temperature time series statistics:
----

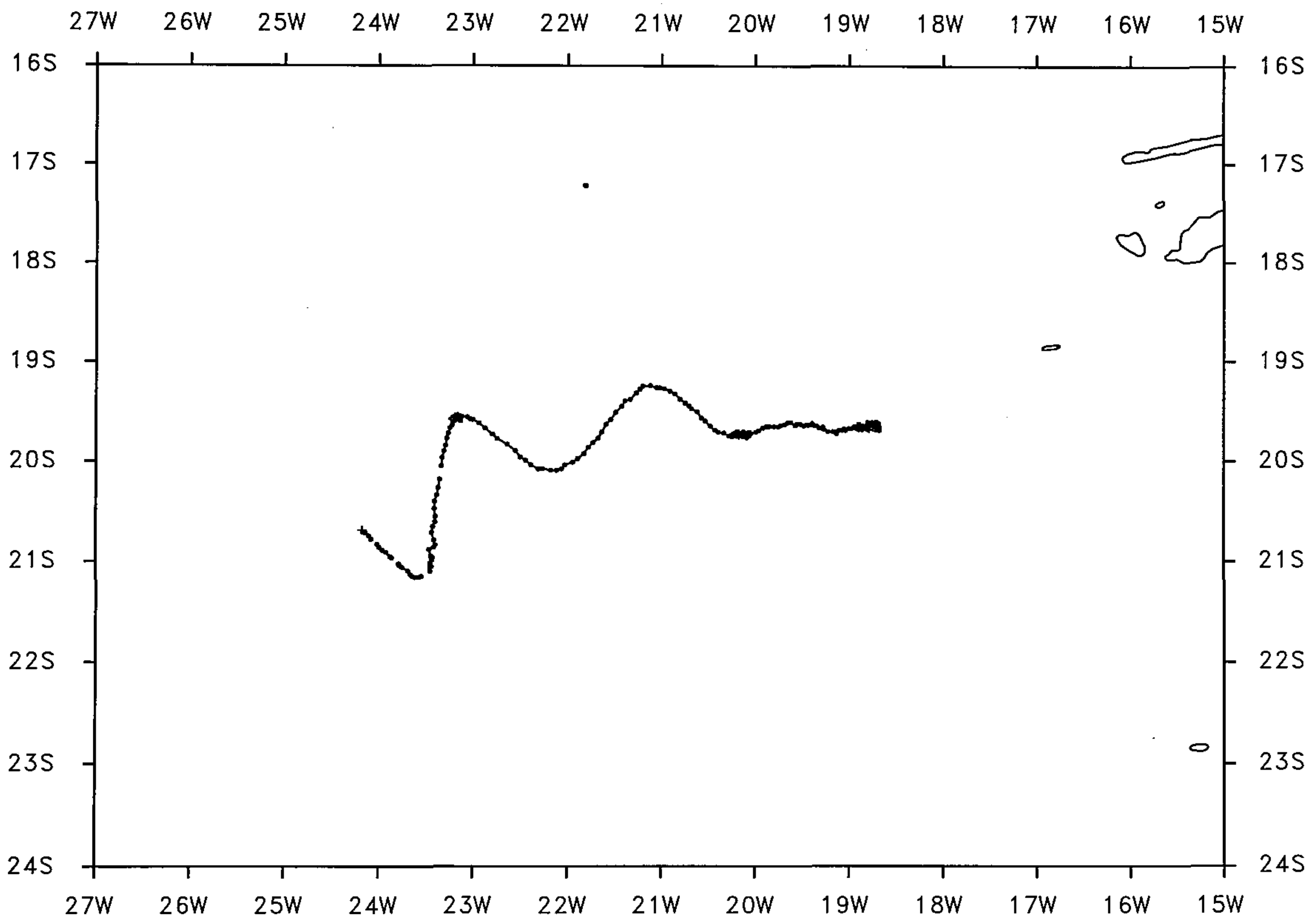
sampling interval= 24 h
number of samples= 174

average temperature= 4.07 degC

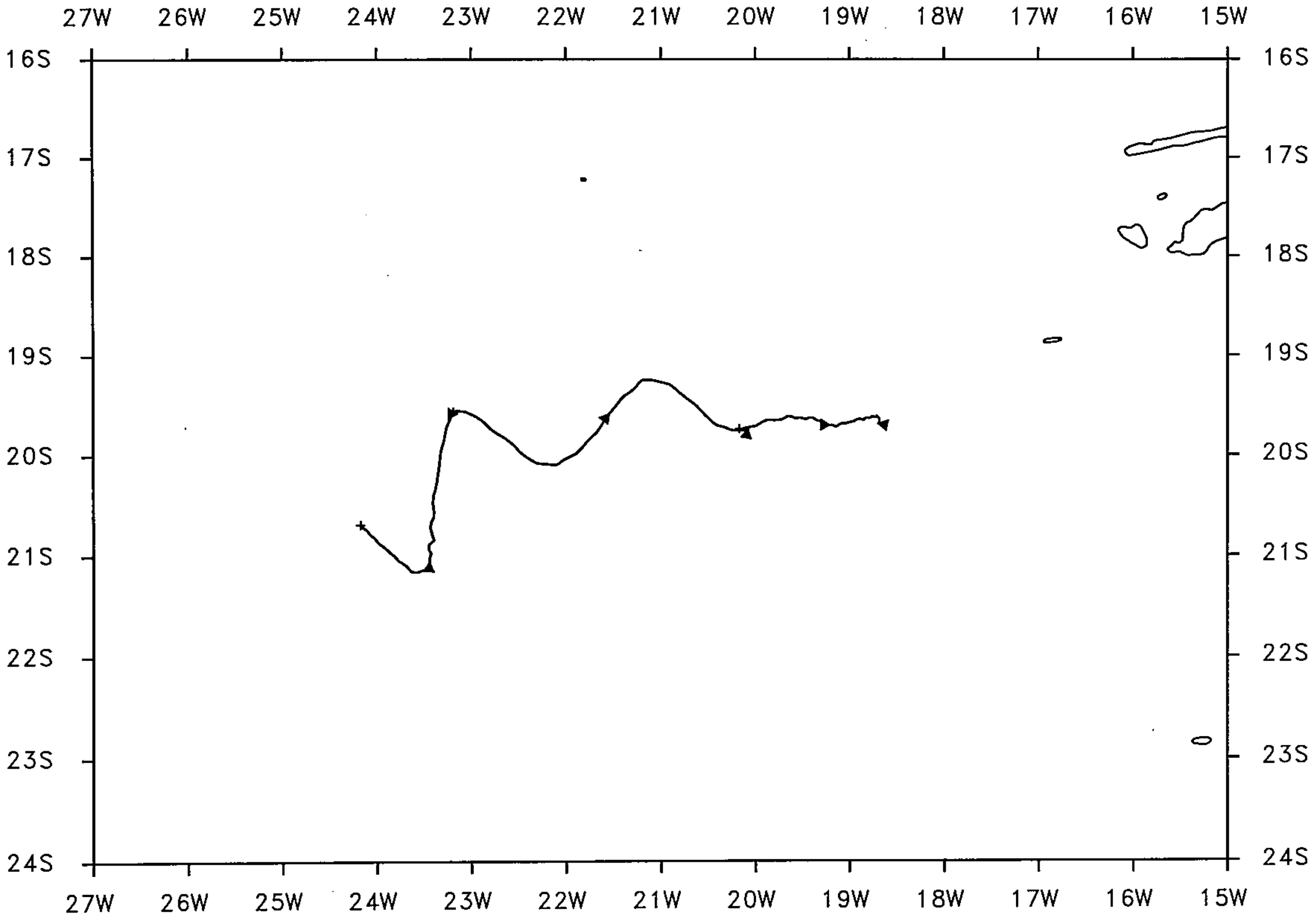
temperature variance= 0.0230 degC*degC

covar(u,temp)= 0.02 cm.degC/s
covar(v,temp)= -0.10 cm.degC/s

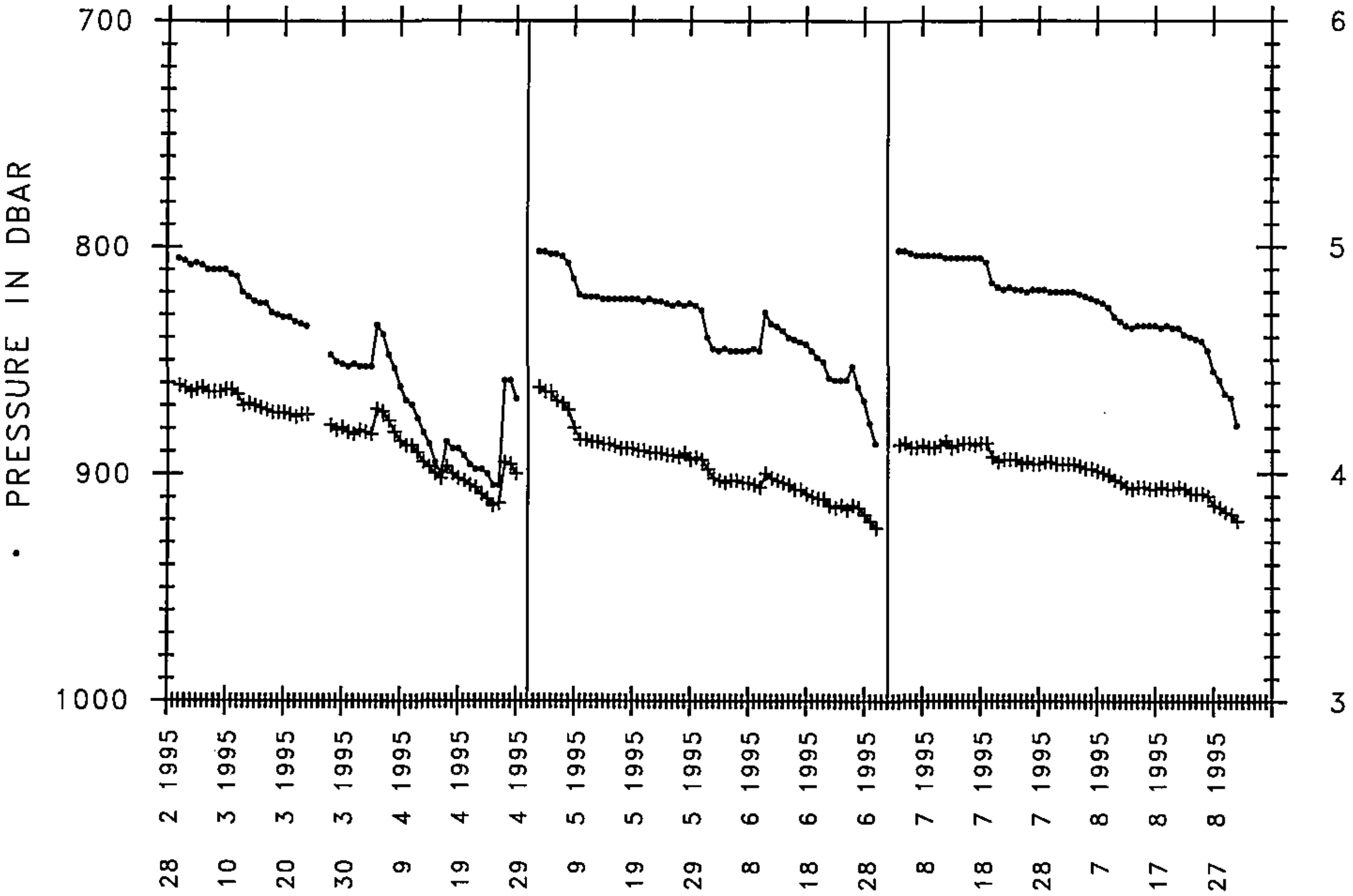
Comments:

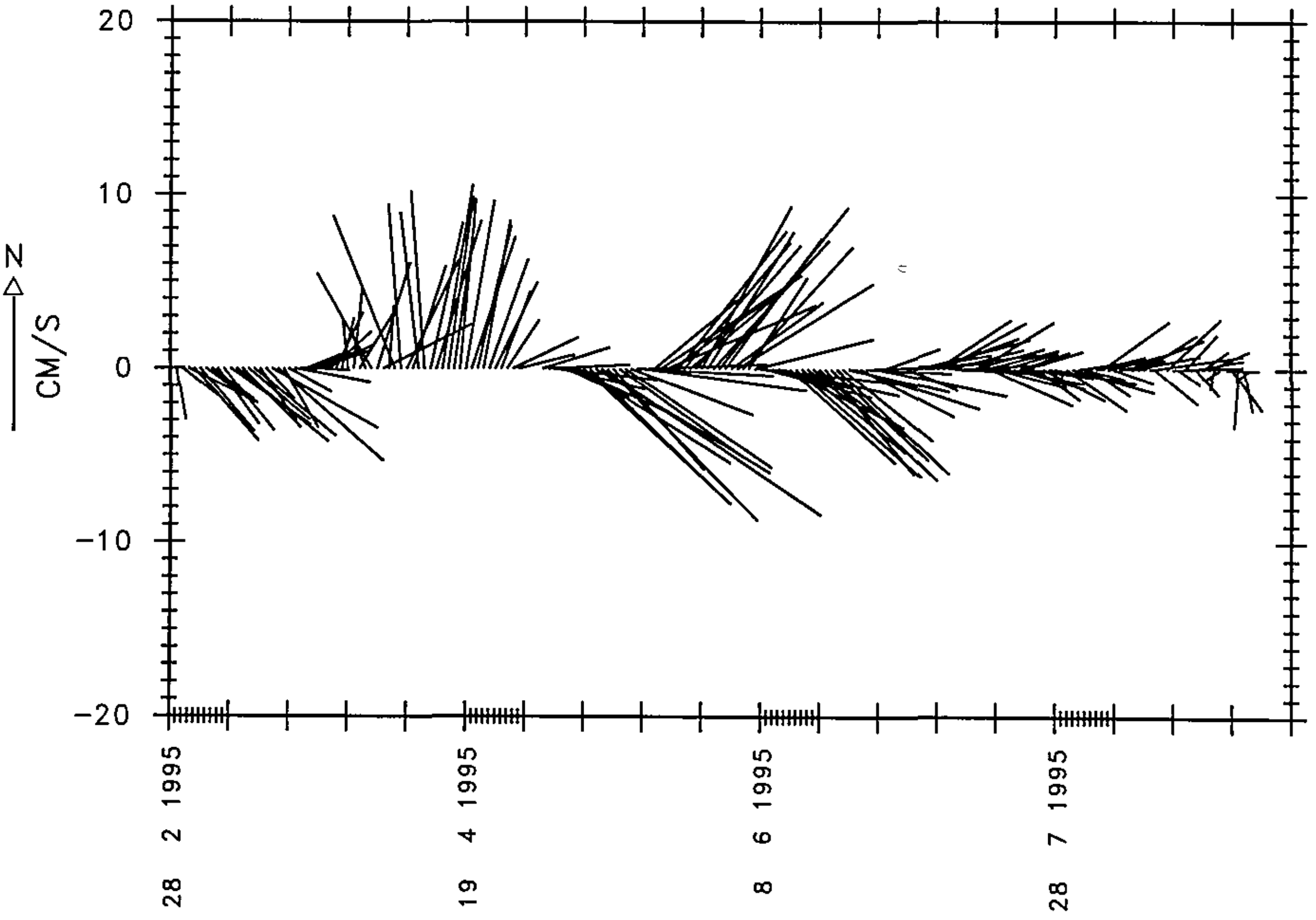


SAMBA M111 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M111 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M111 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #112

LAUNCHED AT: 18°30.0'S 31°34.2'W on 20/02/1994 23h02 UT

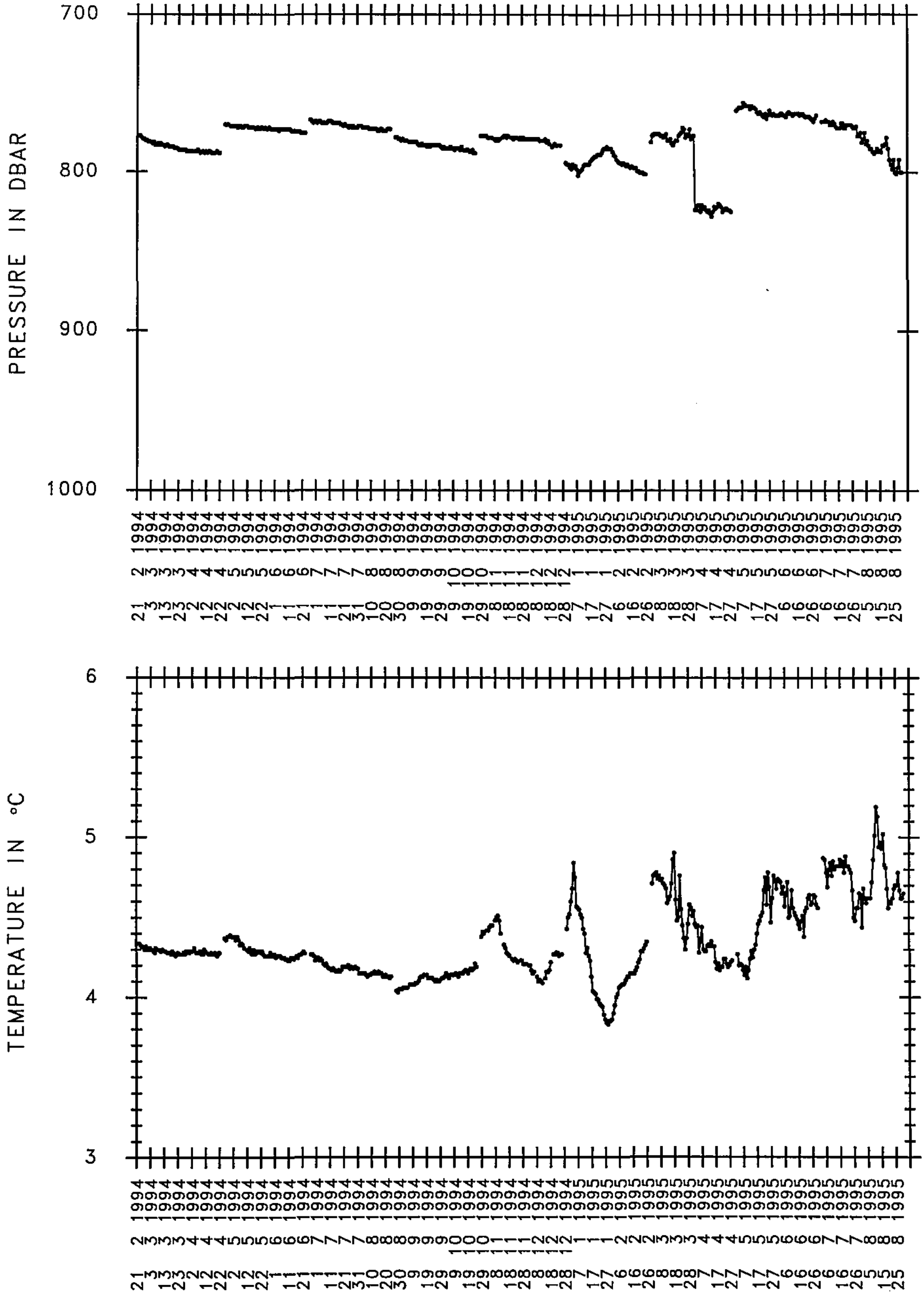
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

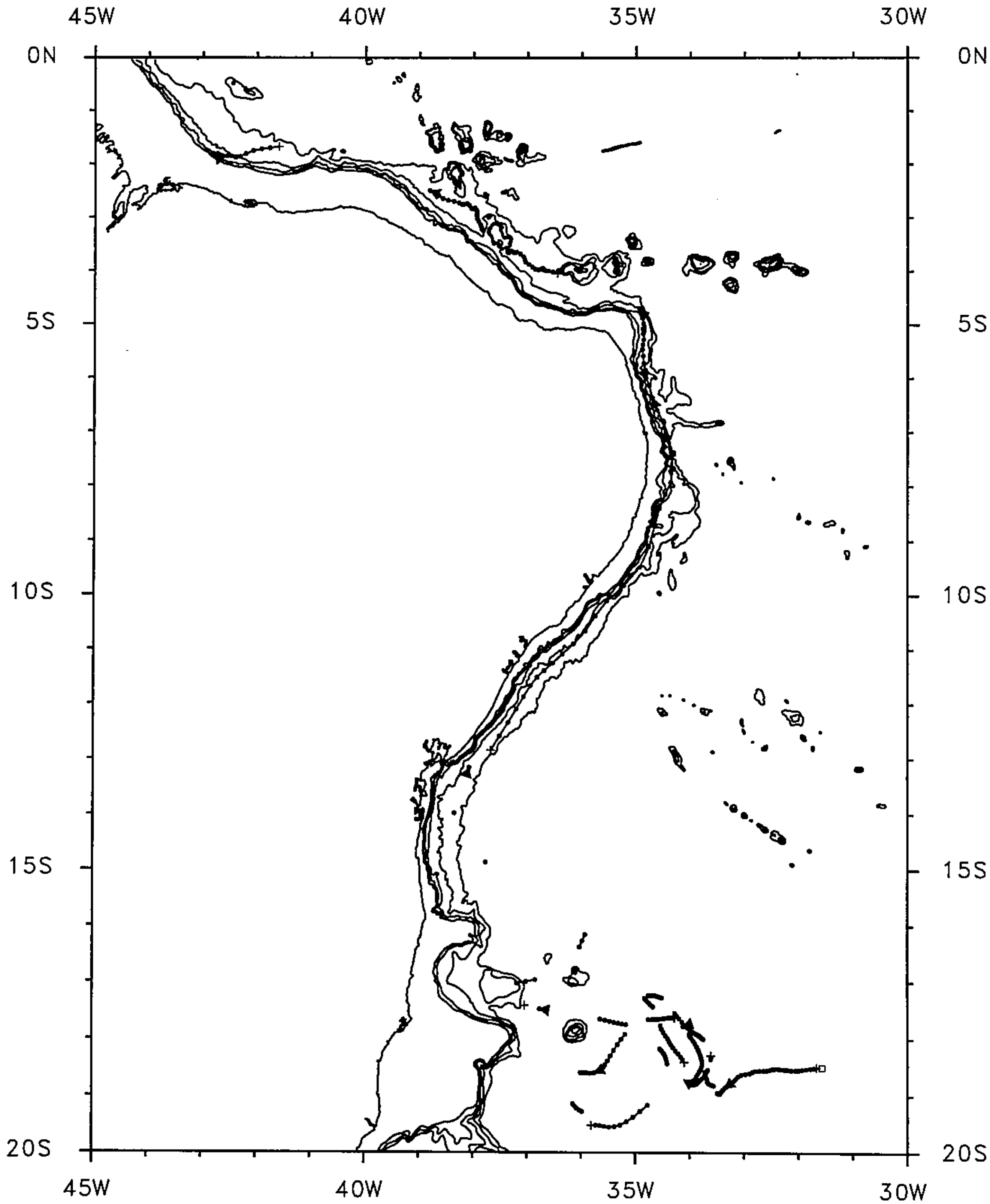
Contrary to MARVOR #111, this float flew westward, and was entrained within the IWBC after some wandering to the west of Abrolhos bank. After 1 year, this float surfaced just offshore Salvador da Bahia (MARVOR #108 surfaced there too, but 4 months later). It then followed roughly the 2000 m bathymetric line, fast flowing northward (0.5 m s^{-1} maximum velocity), to 4°40'S, 35°W, north east of Natal. However the float showed a stagnation point during one week, just offshore Natal. Wether the float would have turned west at 800 dbar near 4°40'S, 35°W is not certain, because it slowed down prior to reaching that point and finally surfaced. Then the north brasilian surface current brought it west (150 km in 2 days). Afterwards, during cycles #8 and #9, the float showed a persistent but slow westward flow.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m112-c1.raw	m112-c1.fin	m112-c1.diaric
m112-c2.raw	m112-c2.fin	m112-c2.diaric
m112-c3.raw	m112-c3.fin	m112-c3.diaric
m112-c4.raw	m112-c4.fin	m112-c4.diaric
m112-c5.raw	m112-c5.fin	m112-c5.diaric
m112-c6.raw	m112-c6.fin	m112-c6.diaric
m112-c7.raw	m112-c7.fin	m112-c7.diaric
m112-c8.raw	m112-c8.fin	m112-c8.diaric
m112-c9.raw	m112-c9.fin	m112-c9.diaric



SAMBA M112 CYCLES 1 TO 9



SAMBA M112 (FEBRUARY 1994 – AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m112

launch date	launch lat	launch long
1994 2 20 23h UT	18.500 S	31.570 W

file	m112-c1.fin	m112-c2.fin	m112-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 25 (16186)	1994 6 28 (16250)
1st pos	31.667W 18.498S	34.097W 18.403S	33.609W 18.289S
last pos	33.720W 18.574S	33.753W 17.998S	34.122W 17.776S
1st P and T	777dbar 4.34degC	770dbar 4.37degC	767dbar 4.27degC
last P and T	788dbar 4.28degC	775dbar 4.28degC	773dbar 4.13degC
displacements (East and North)	-216km -8km	36km 45km	-54km 57km
mean velocities (East and North)	-4.47cm/s -0.17cm/s	0.72cm/s 0.90cm/s	-1.10cm/s 1.16cm/s
number of pos	52	44	53

Velocity time series statistics:

sampling interval= 24 h
number of samples= 149

15 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.90 cm/s [-4.04, 0.24]
average north velocity comp.= 0.70 cm/s [-1.37, 2.76]

variances
variance of east velocity comp.= 15.09 cm2/s2 [4.29, 25.90]
variance of north velocity comp.= 14.12 cm2/s2 [4.01, 24.23]

covariance
covariance= -1.91 cm2/s2 [-9.30, 5.48]

Eddy Kinetic Energy
EKE= 14.61 cm2/s2 [7.21, 22.00]

Temperature time series statistics:

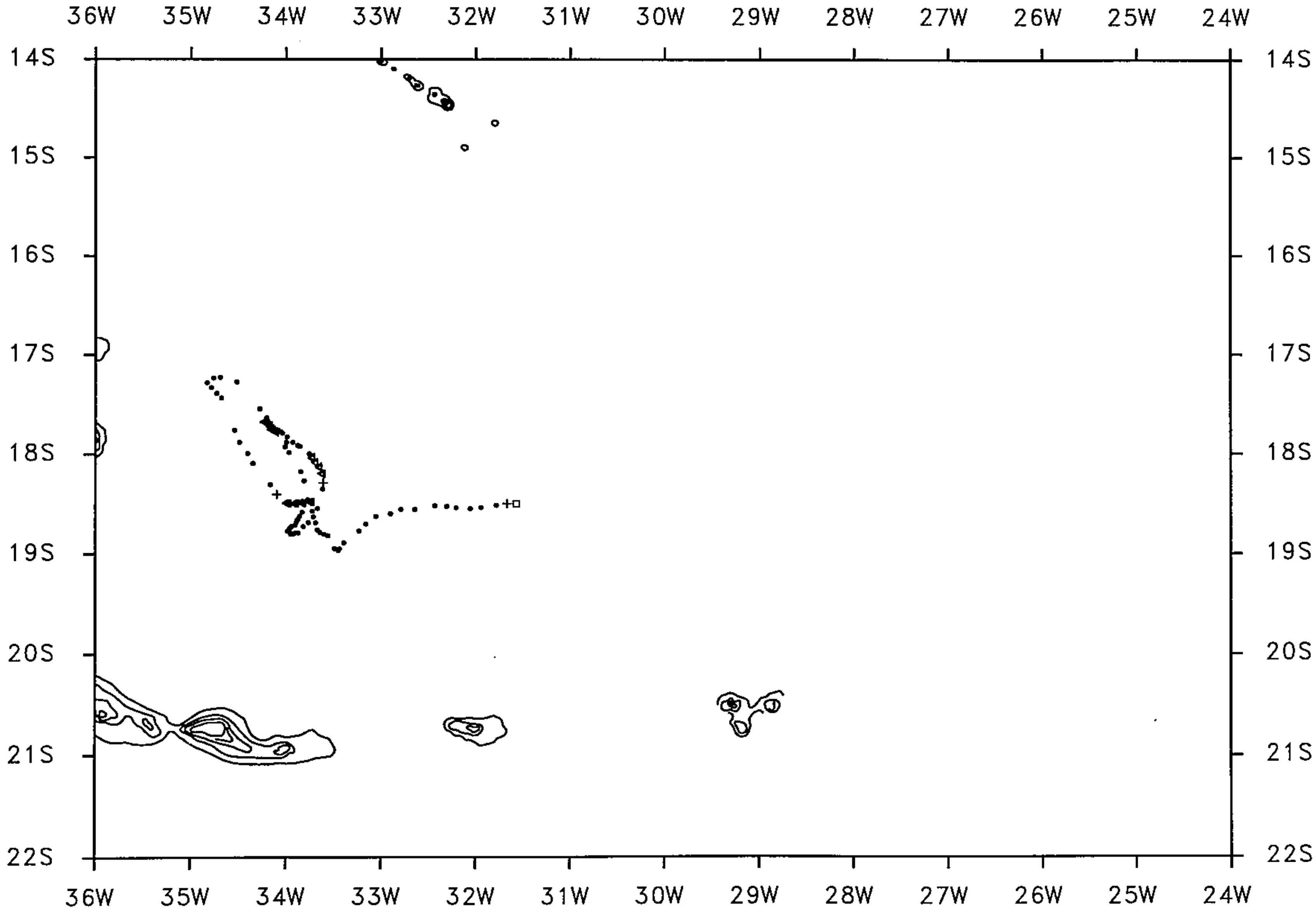
sampling interval= 24 h
number of samples= 146

average temperature= 4.25 degC

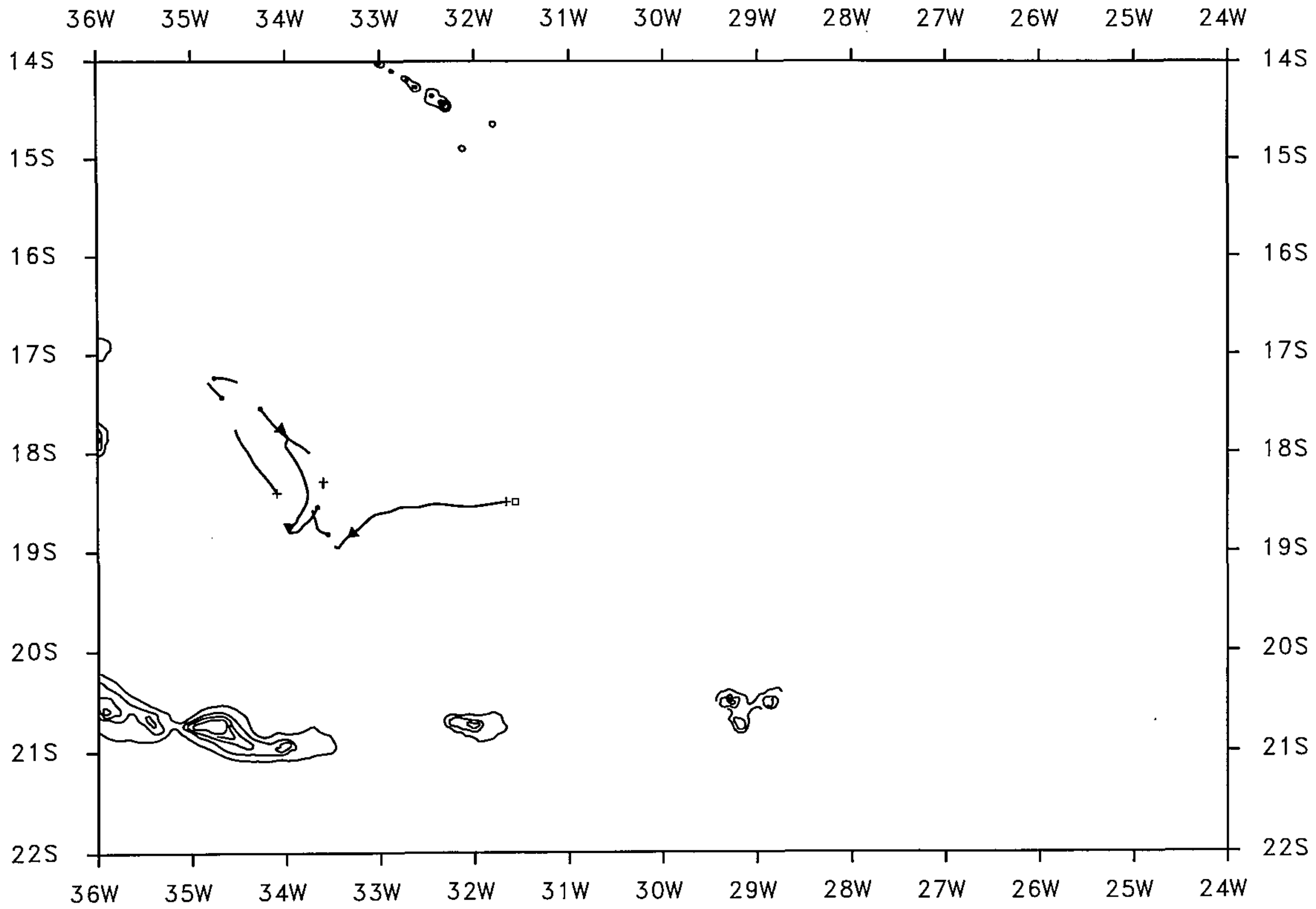
temperature variance= 0.0046 degC*degC

covar(u,temp)= -0.08 cm.degC/s
covar(v,temp)= 0.00 cm.degC/s

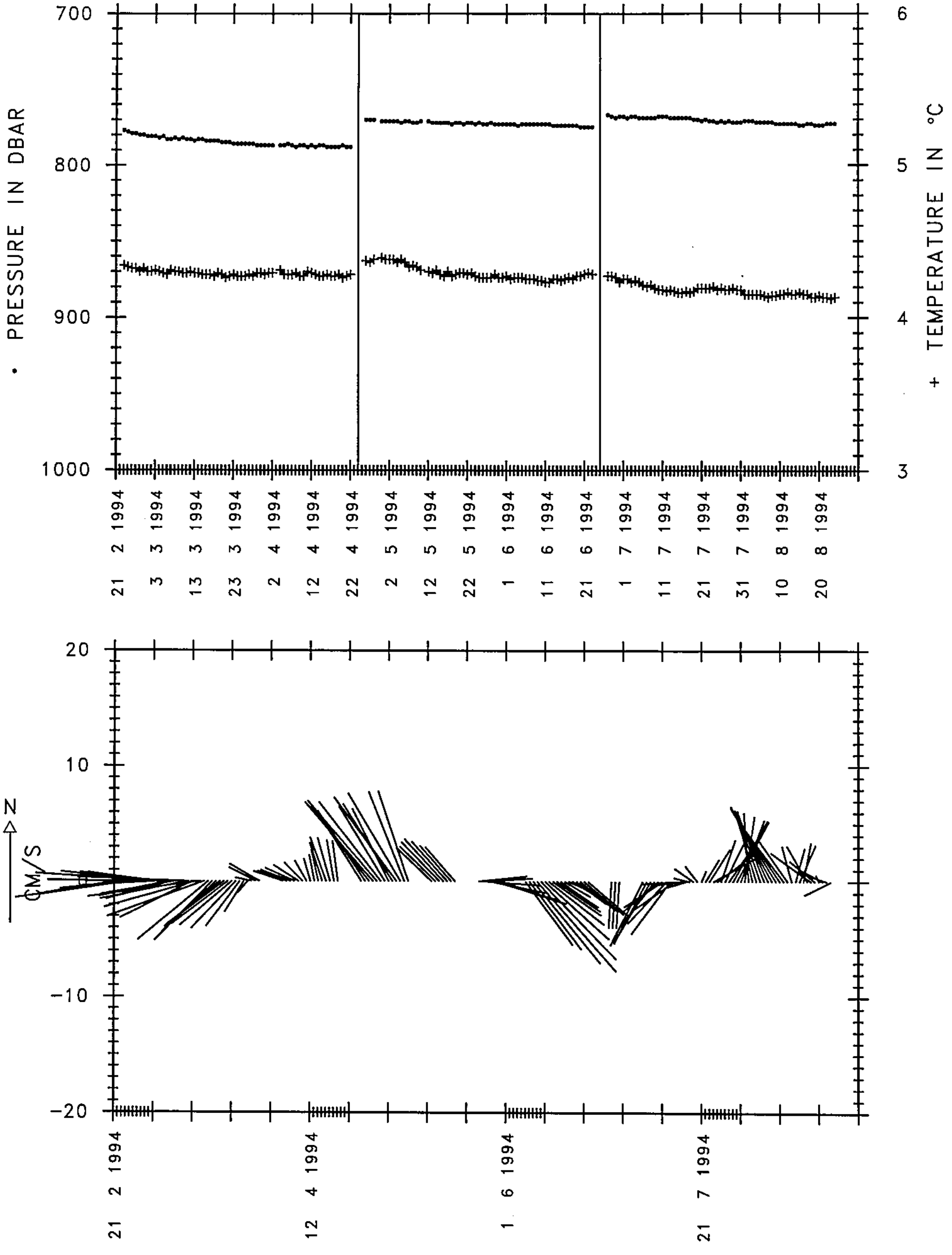
Comments:



SAMBA M112 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M112 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M112 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m112

launch date	launch lat	launch long
1994 2 20 23h UT	18.500 S	31.570 W

file	m112-c4.fin	m112-c5.fin	m112-c6.fin
date of 1st pos	1994 8 27 (16310)	1994 10 30 (16374)	1994 12 29 (16434)
1st pos	34.281W 17.628S	35.809W 19.519S	37.044W 17.411S
last pos	35.987W 19.277S	36.768W 17.471S	38.076W 13.159S
1st P and T	778dbar 4.04degC	777dbar 4.38degC	794dbar 4.43degC
last P and T	788dbar 4.19degC	783dbar 4.27degC	801dbar 4.35degC
displacements (East and North)	-180km -183km	-101km 228km	-111km 472km
mean velocities (East and North)	-3.59cm/s -3.66cm/s	-2.05cm/s 4.62cm/s	-2.17cm/s 9.27cm/s
number of pos	35	28	10

Velocity time series statistics:

sampling interval= 24 h
number of samples= 68

7 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.22 cm/s [-8.05, 7.61]
average north velocity comp.= 0.62 cm/s [-4.87, 6.11]

variances
variance of east velocity comp.= 76.69 cm2/s2 [-3.66, 157.04]
variance of north velocity comp.= 37.71 cm2/s2 [-1.80, 77.22]

covariance
covariance= 25.44 cm2/s2 [-14.40, 65.28]

Eddy Kinetic Energy
EKE= 57.20 cm2/s2 [12.43, 101.97]

Temperature time series statistics:

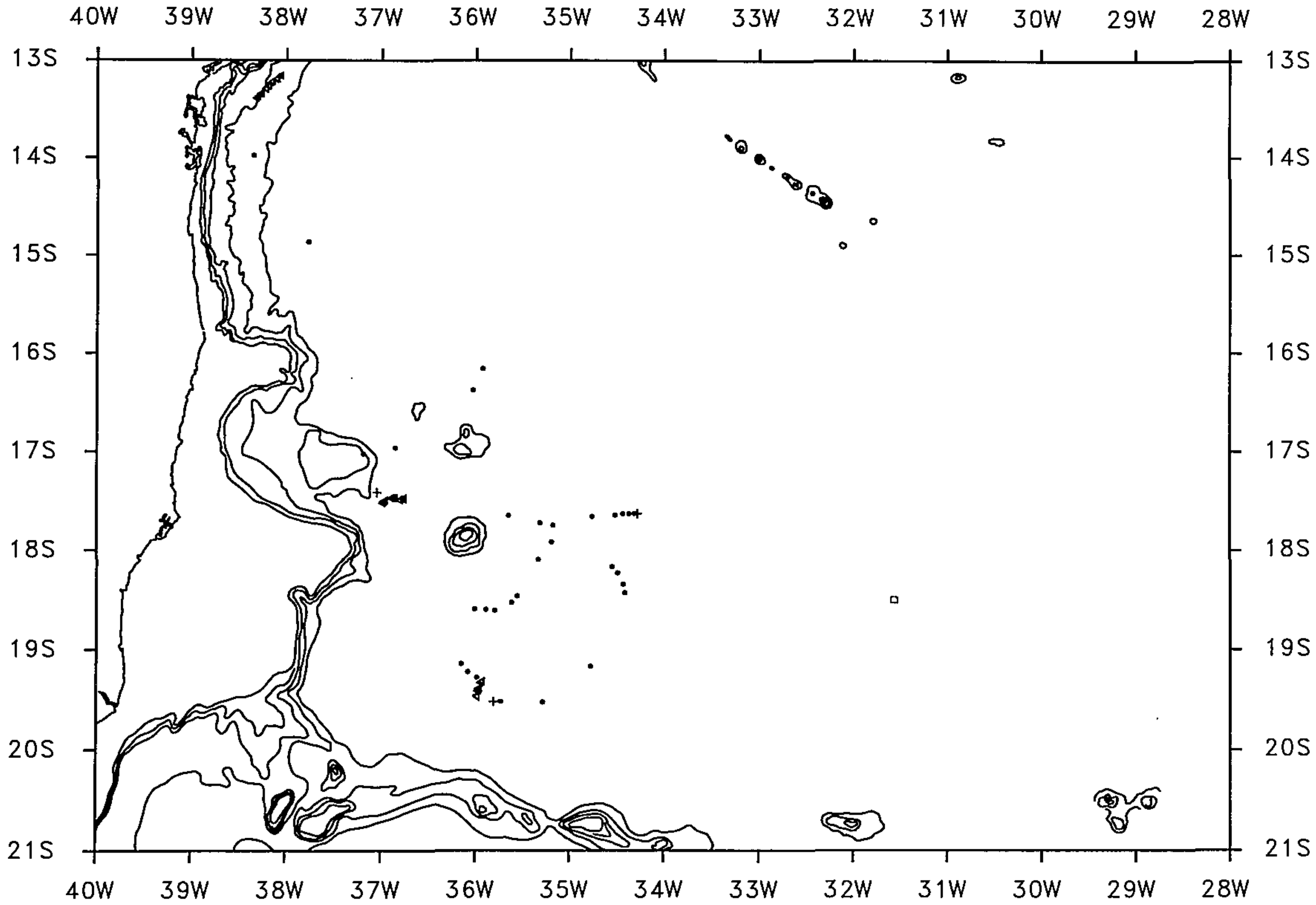
sampling interval= 24 h
number of samples= 61

average temperature= 4.22 degC

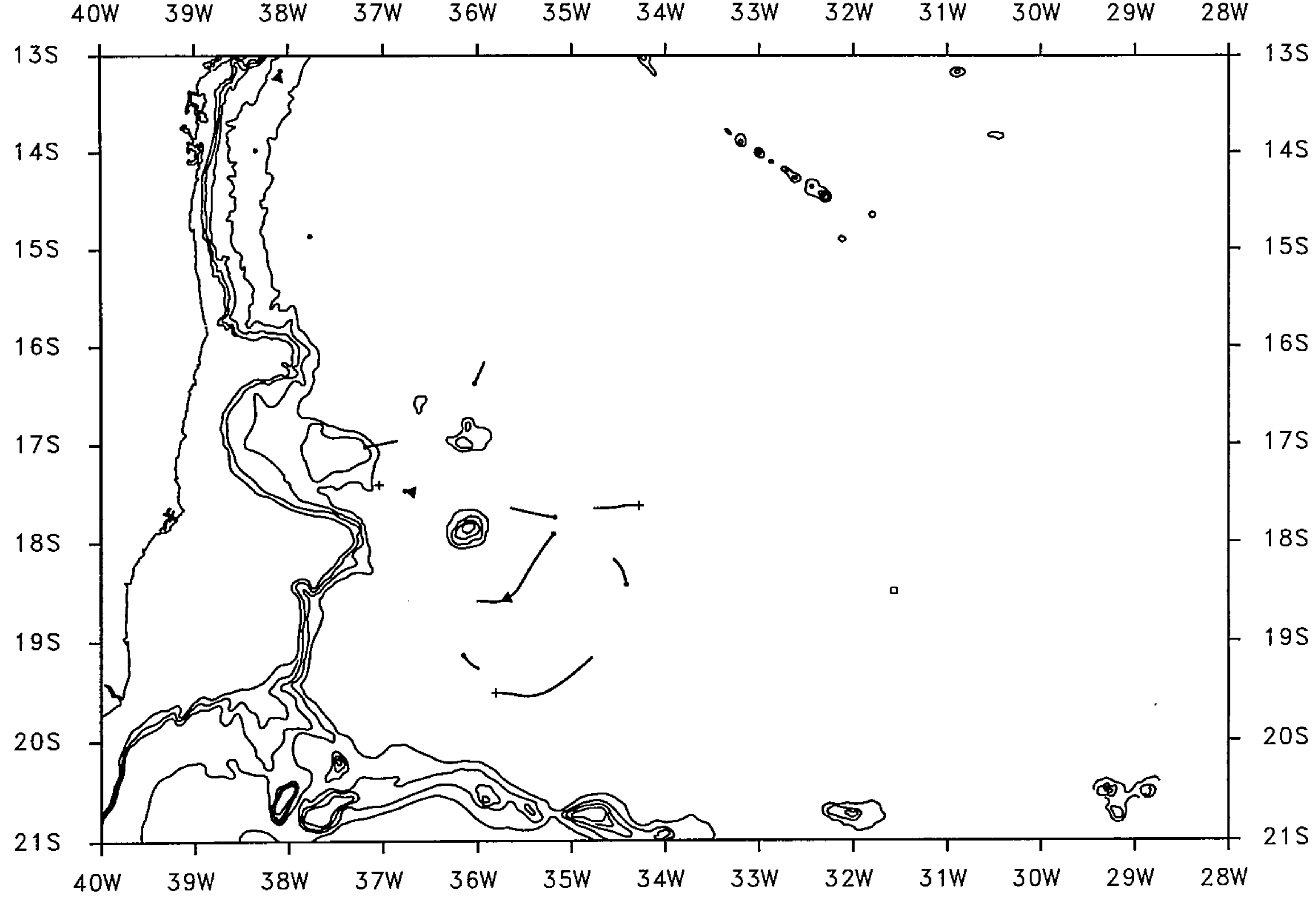
temperature variance= 0.0307 degC*degC

covar(u,temp)= 1.37 cm.degC/s
covar(v,temp)= 0.51 cm.degC/s

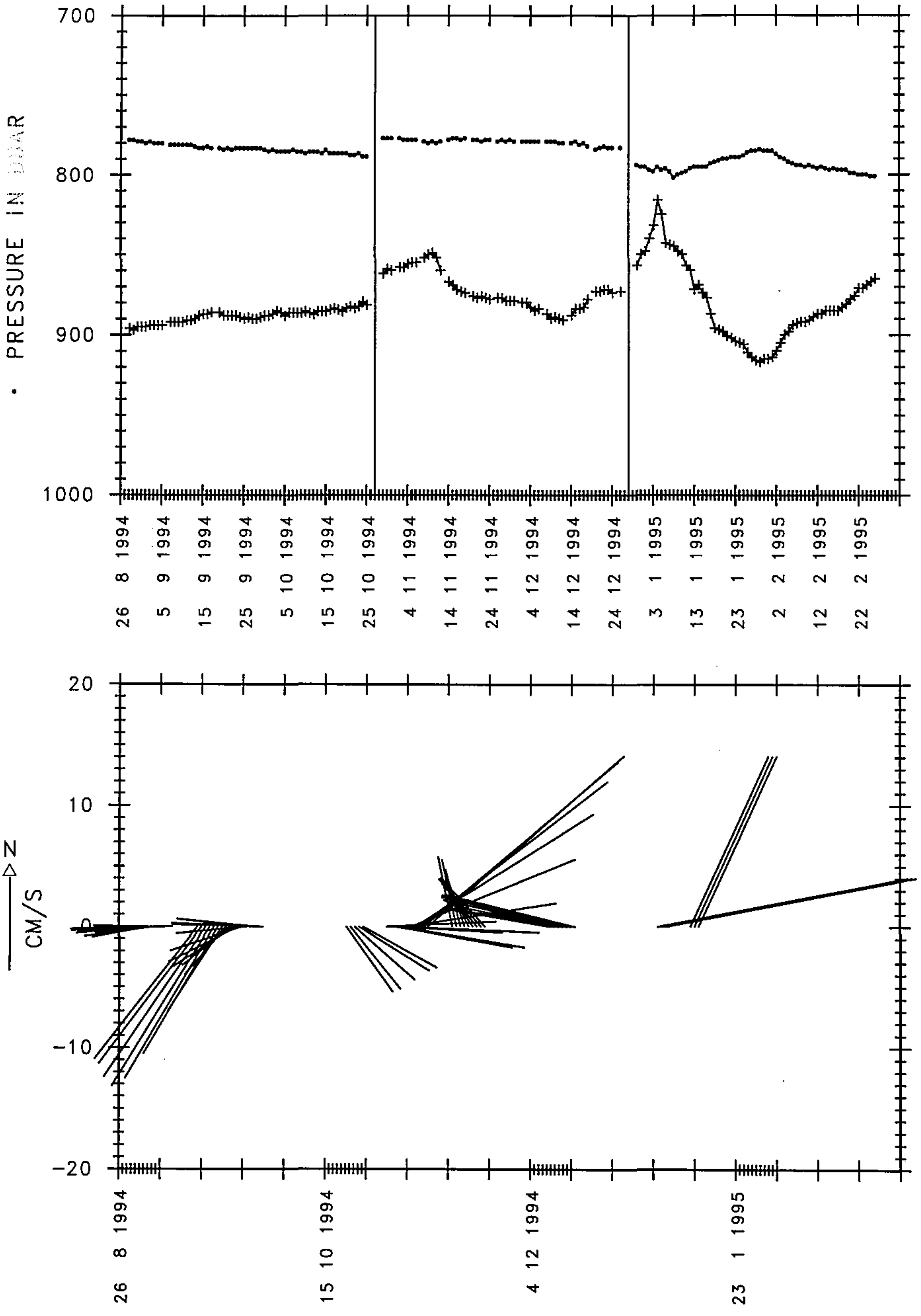
Comments:



SAMBA M112 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M112 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M112 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m112

launch date	launch lat	launch long
1994 2 20 23h UT	18.500 S	31.570 W

file	m112-c7.fin	m112-c8.fin	m112-c9.fin
date of 1st pos	1995 3 4 (16499)	1995 5 2 (16558)	1995 7 3 (16620)
1st pos	37.675W 12.843S	36.452W 4.046S	41.606W 1.672S
last pos	34.945W 4.690S	38.815W 2.497S	42.819W 1.806S
1st P and T	781dbar 4.71degC	761dbar 4.27degC	768dbar 4.87degC
last P and T	825dbar 4.23degC	764dbar 4.56degC	800dbar 4.65degC
displacements (East and North)	300km 906km	-262km 172km	-135km -15km
mean velocities (East and North)	6.20cm/s 18.72cm/s	-5.14cm/s 3.38cm/s	-2.69cm/s -0.30cm/s
number of pos	57	52	36

Velocity time series statistics:

sampling interval= 24 h
number of samples= 144

14 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.44 cm/s [-6.42, 5.55]
average north velocity comp.= 8.37 cm/s [1.01, 15.72]

variances
variance of east velocity comp.= 108.87 cm2/s2 [28.22, 189.53]
variance of north velocity comp.= 164.72 cm2/s2 [42.69, 286.74]

covariance
covariance= 83.33 cm2/s2 [13.18, 153.48]

Eddy Kinetic Energy
EKE= 136.80 cm2/s2 [63.66, 209.93]

Temperature time series statistics:

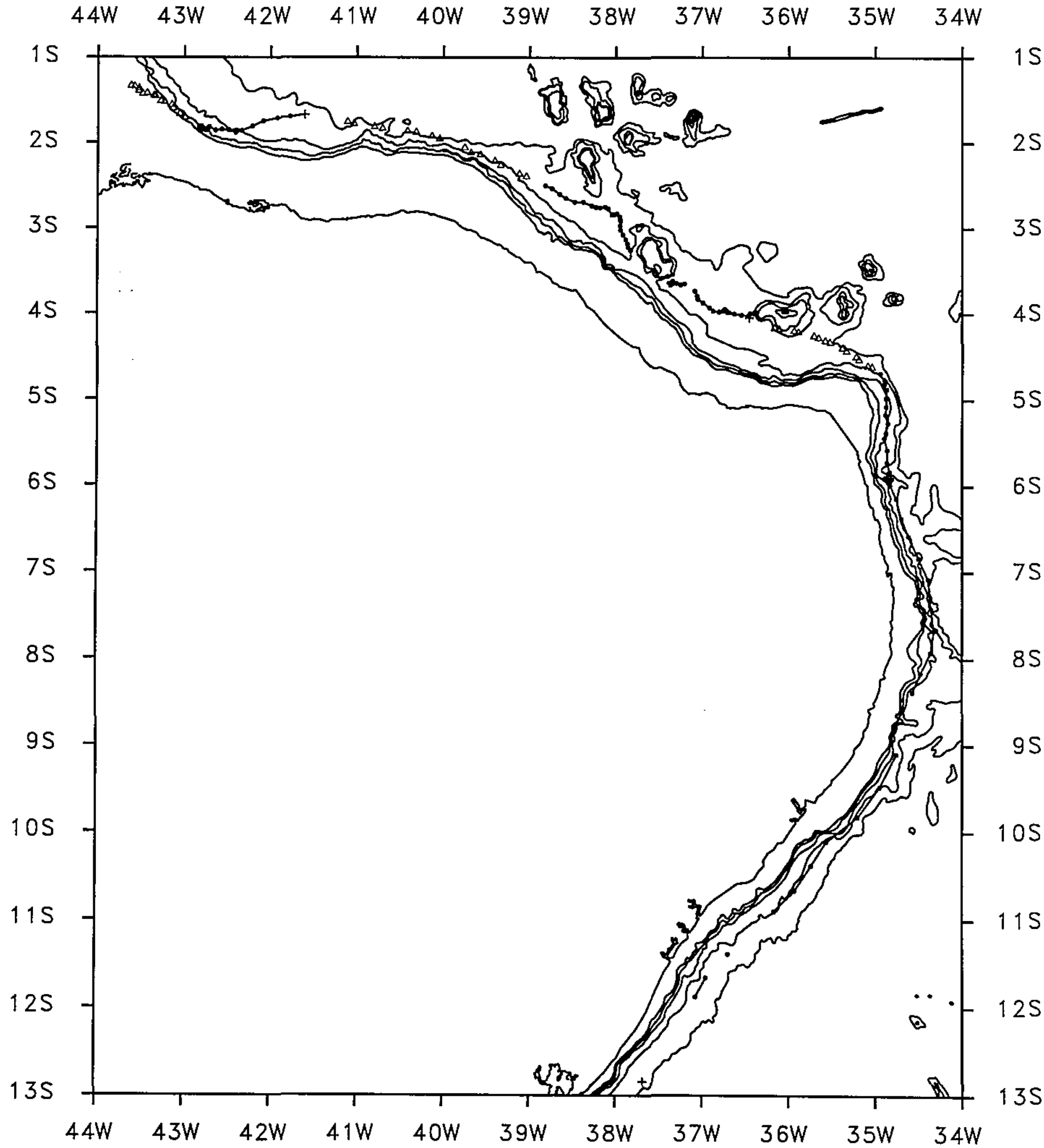
sampling interval= 24 h
number of samples= 142

average temperature= 4.54 degC

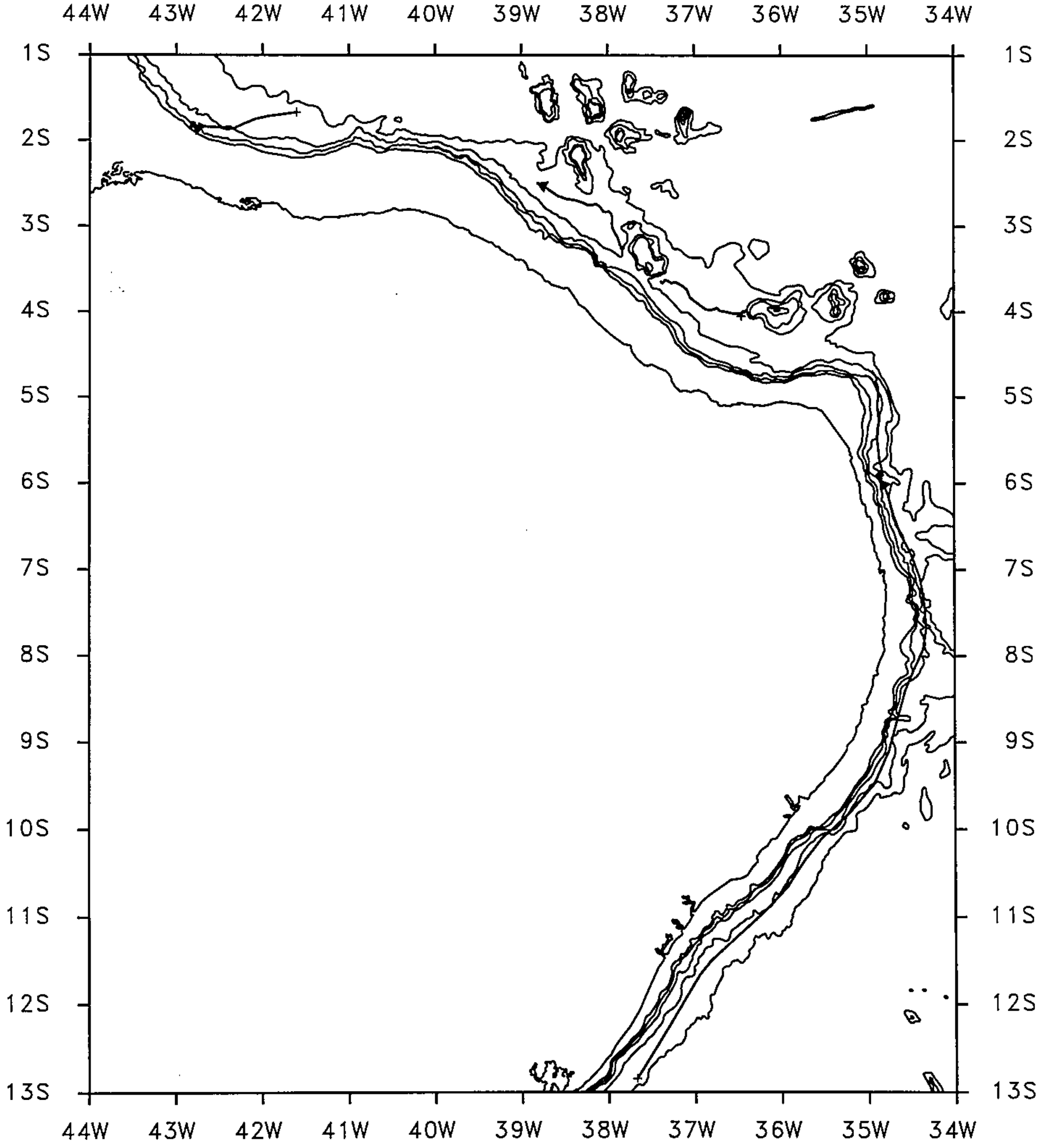
temperature variance= 0.0539 degC*degC

covar(u,temp)= 0.39 cm.degC/s
covar(v,temp)= 0.05 cm.degC/s

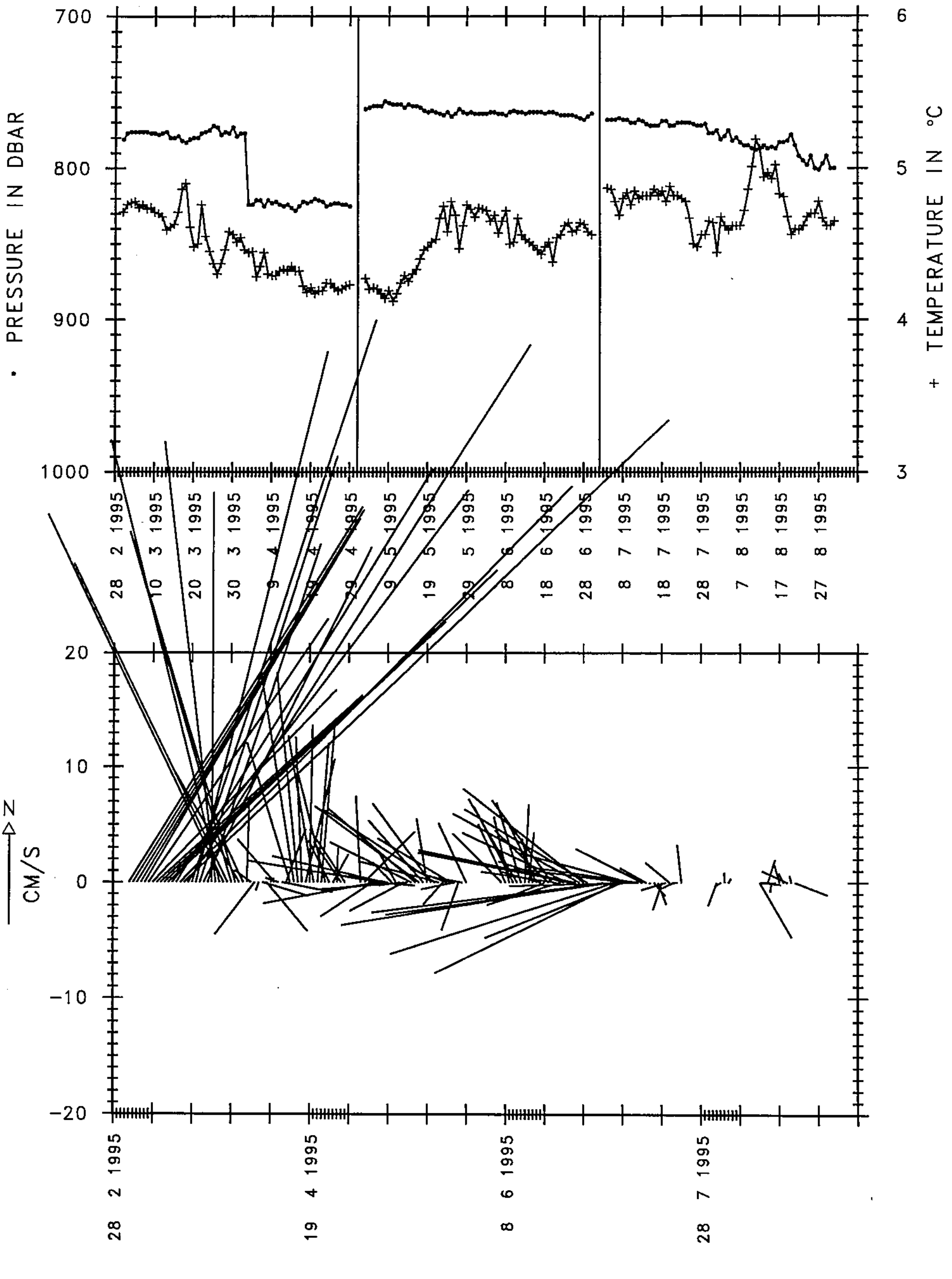
Comments:



SAMBA M112 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M112 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M112 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #113

LAUNCHED AT: 18°28.7'S 31°21.6'W on 21/02/1994 03h34 UT

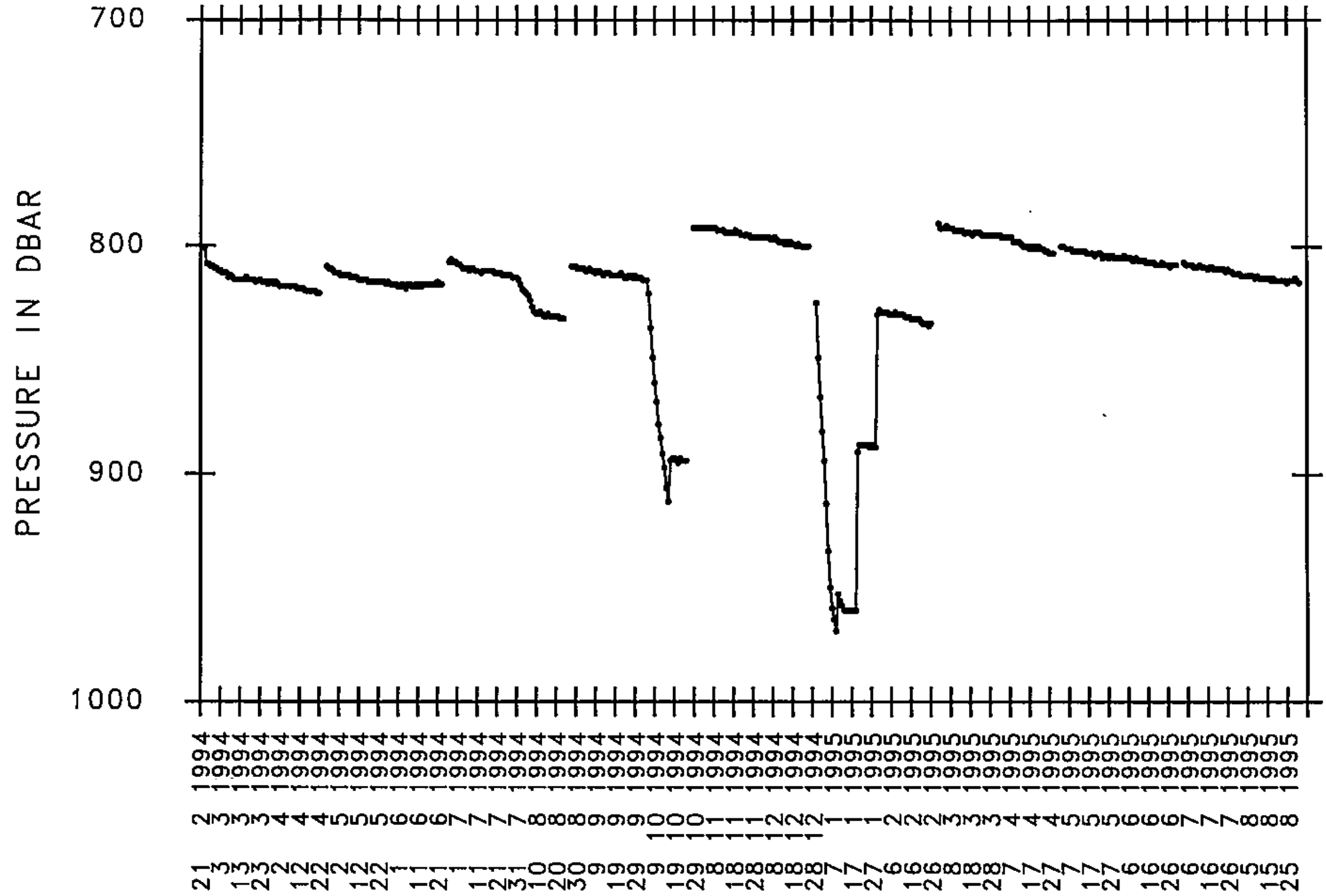
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

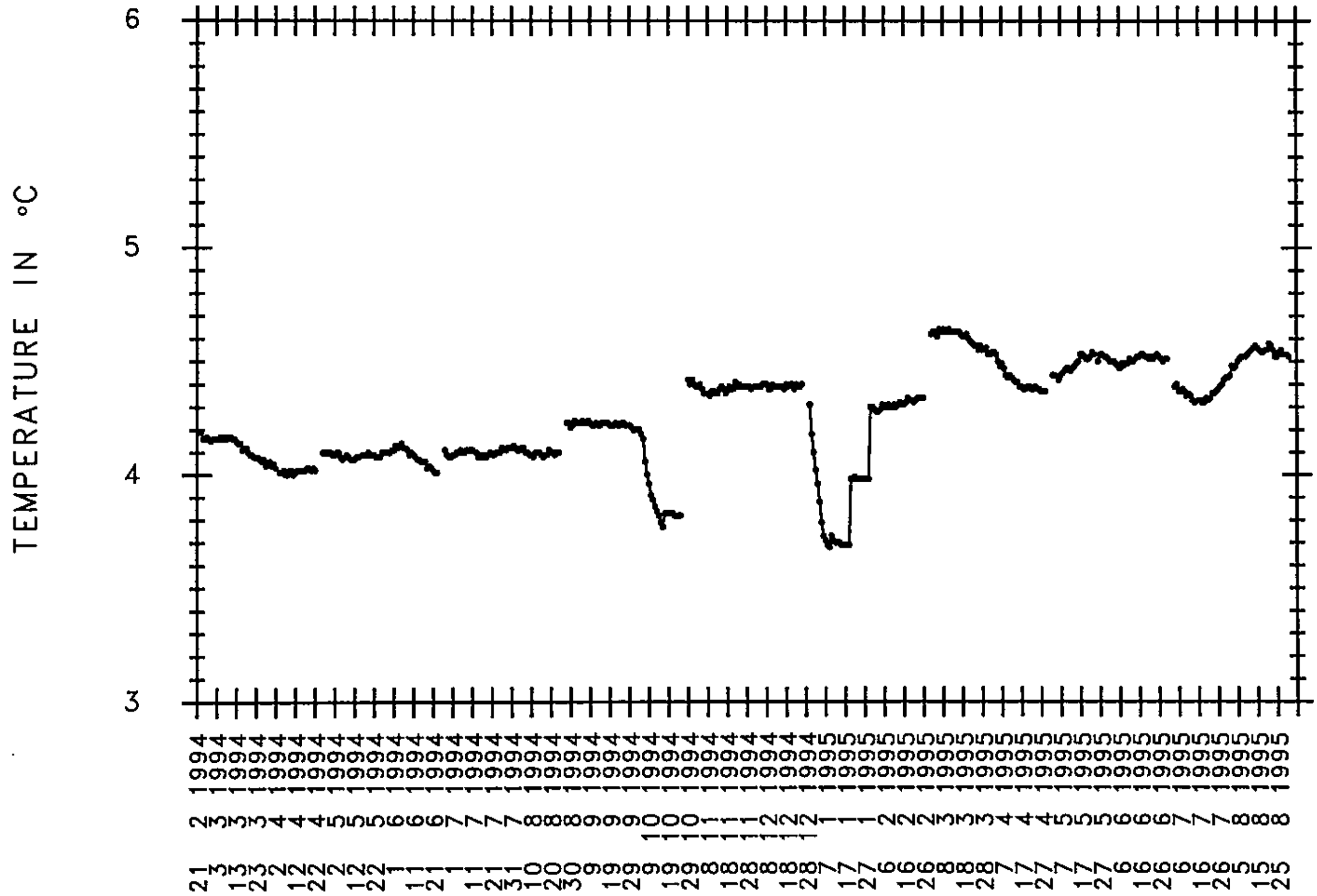
Comments

This float flowed generally southeastward and was apparently taken during its ninth cycle in the westward flow already revealed by MARVOR #101 to #110 south of the Vitoria-Trindade chain. This float pleads for an exchange between the regions north and south of the chain besides the western boundary (see also float #115).
During cycles #4 and #6, slight hydraulic problems occurred. As a consequence the float was deeper than 900 dbar for 18 days.

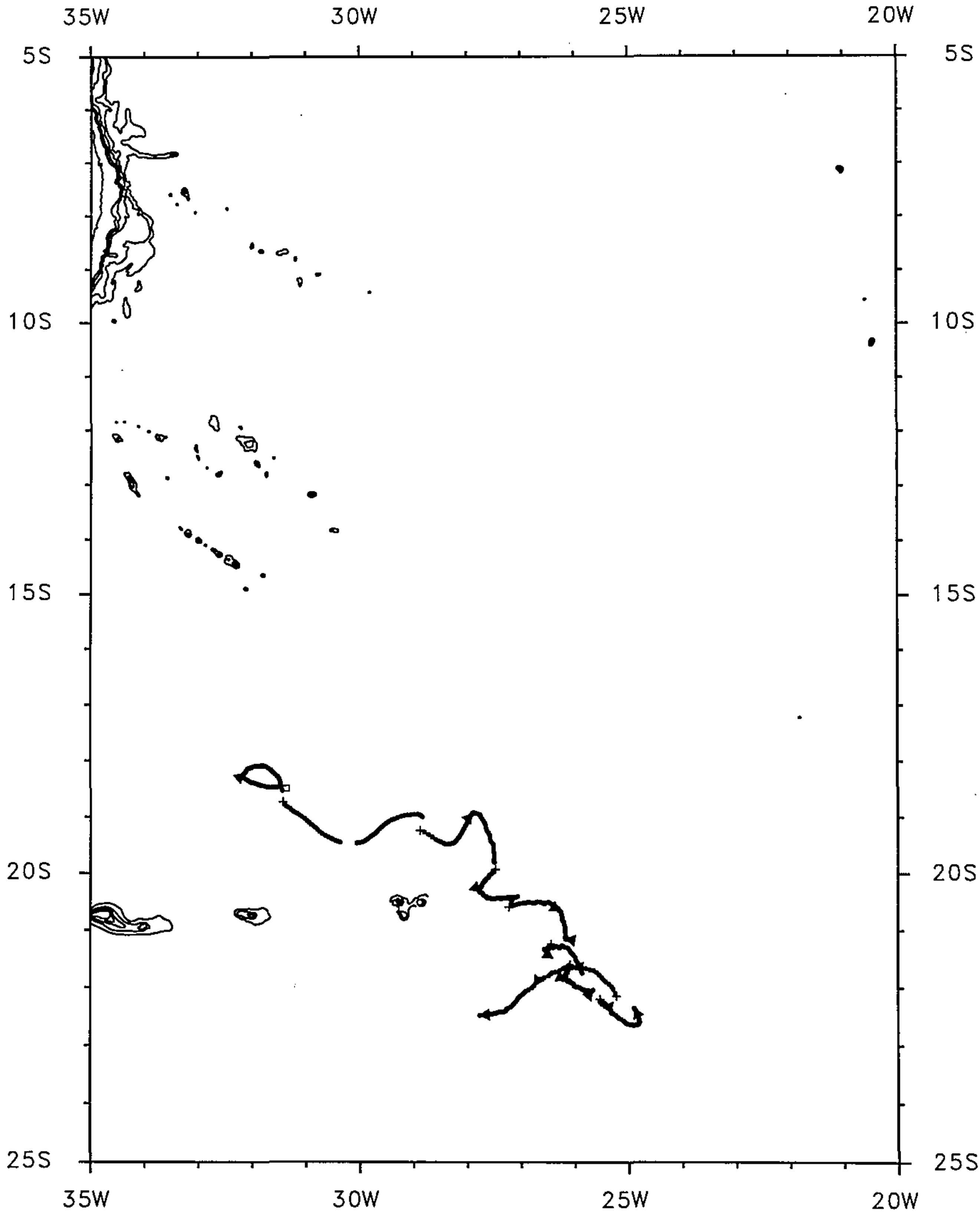
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m113-c1.raw	m113-c1.fin	m113-c1.diaric
m113-c2.raw	m113-c2.fin	m113-c2.diaric
m113-c3.raw	m113-c3.fin	m113-c3.diaric
m113-c4.raw	m113-c4.fin	m113-c4.diaric
m113-c5.raw	m113-c5.fin	m113-c5.diaric
m113-c6.raw	m113-c6.fin	m113-c6.diaric
m113-c7.raw	m113-c7.fin	m113-c7.diaric
m113-c8.raw	m113-c8.fin	m113-c8.diaric
m113-c9.raw	m113-c9.fin	m113-c9.diaric





SAMBA M113 CYCLES 1 TO 9



SAMBA M113 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m113

launch date	launch lat	launch long
1994 2 21 4h UT	18.478 S	31.360 W

file	m113-c1.fin	m113-c2.fin	m113-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 25 (16186)	1994 6 26 (16248)
1st pos	31.436W 18.436S	31.430W 18.733S	28.882W 19.234S
last pos	31.430W 18.521S	28.841W 18.995S	27.499W 19.801S
1st P and T	801dbar 4.19degC	809dbar 4.10degC	807dbar 4.11degC
last P and T	821dbar 4.02degC	817dbar 4.01degC	832dbar 4.10degC
displacements (East and North)	1km -9km	272km -29km	145km -63km
mean velocities (East and North)	0.01cm/s -0.19cm/s	5.43cm/s -0.58cm/s	2.89cm/s -1.26cm/s
number of pos	59	54	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 172

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 2.67 cm/s [0.95, 4.39]
average north velocity comp.= -0.74 cm/s [-2.43, 0.95]

variances
variance of east velocity comp.= 11.32 cm2/s2 [3.71, 18.93]
variance of north velocity comp.= 10.88 cm2/s2 [3.57, 18.20]

covariance
covariance= -1.34 cm2/s2 [-6.62, 3.94]

Eddy Kinetic Energy
EKE= 11.10 cm2/s2 [5.82, 16.38]

Temperature time series statistics:

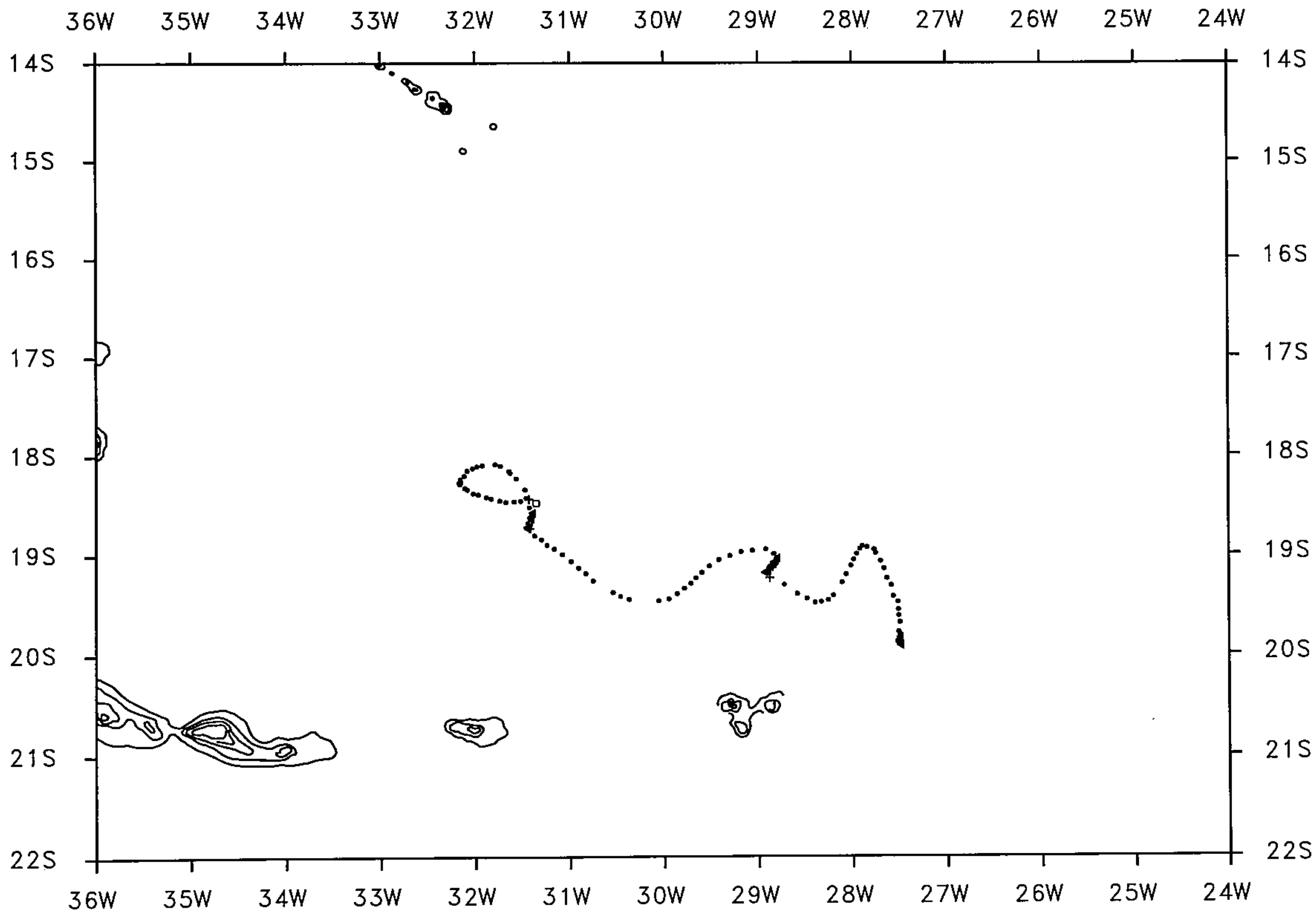
sampling interval= 24 h
number of samples= 166

average temperature= 4.09 degC

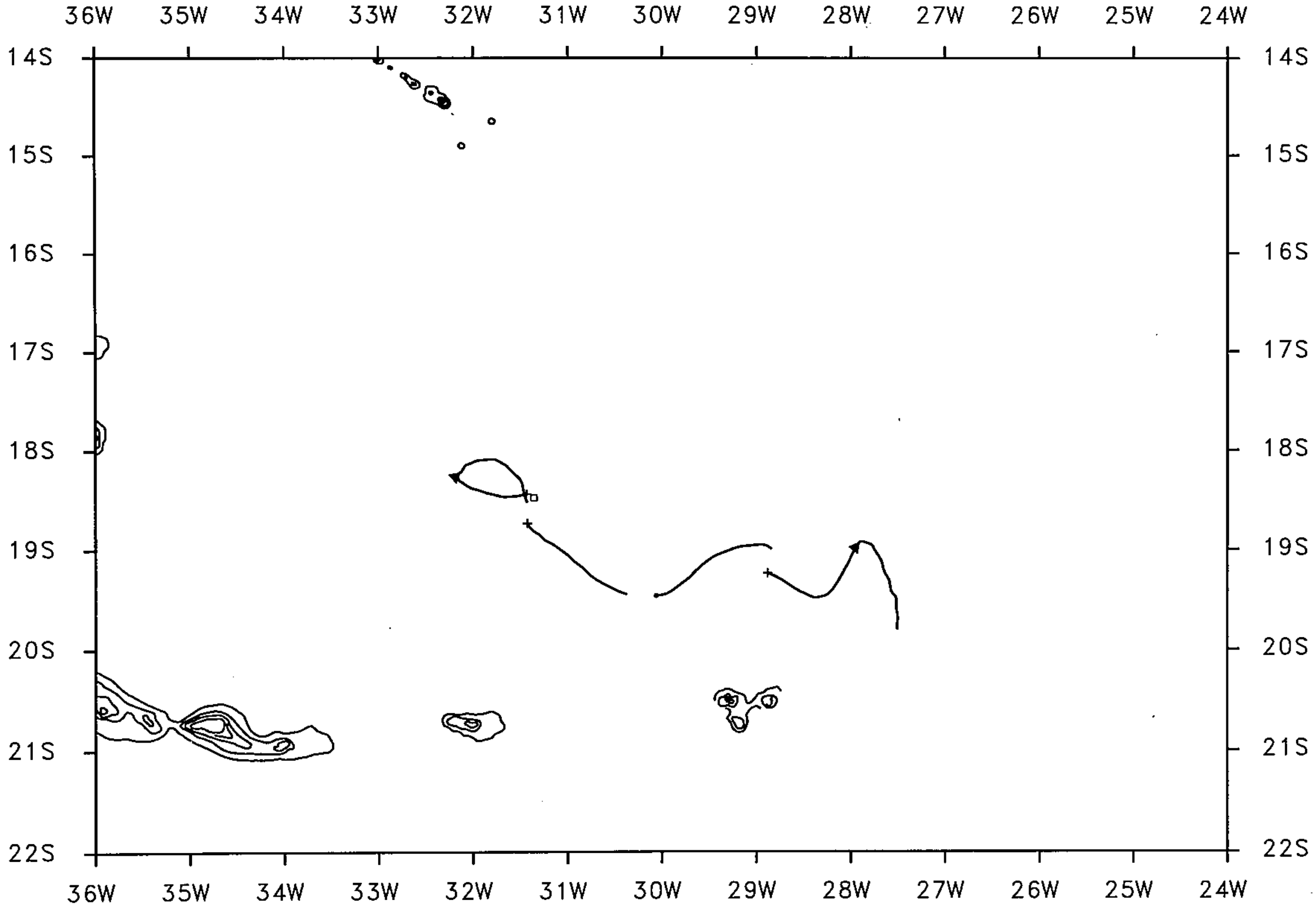
temperature variance= 0.0017 degC*degC

covar(u,temp)= -0.08 cm.degC/s
covar(v,temp)= 0.03 cm.degC/s

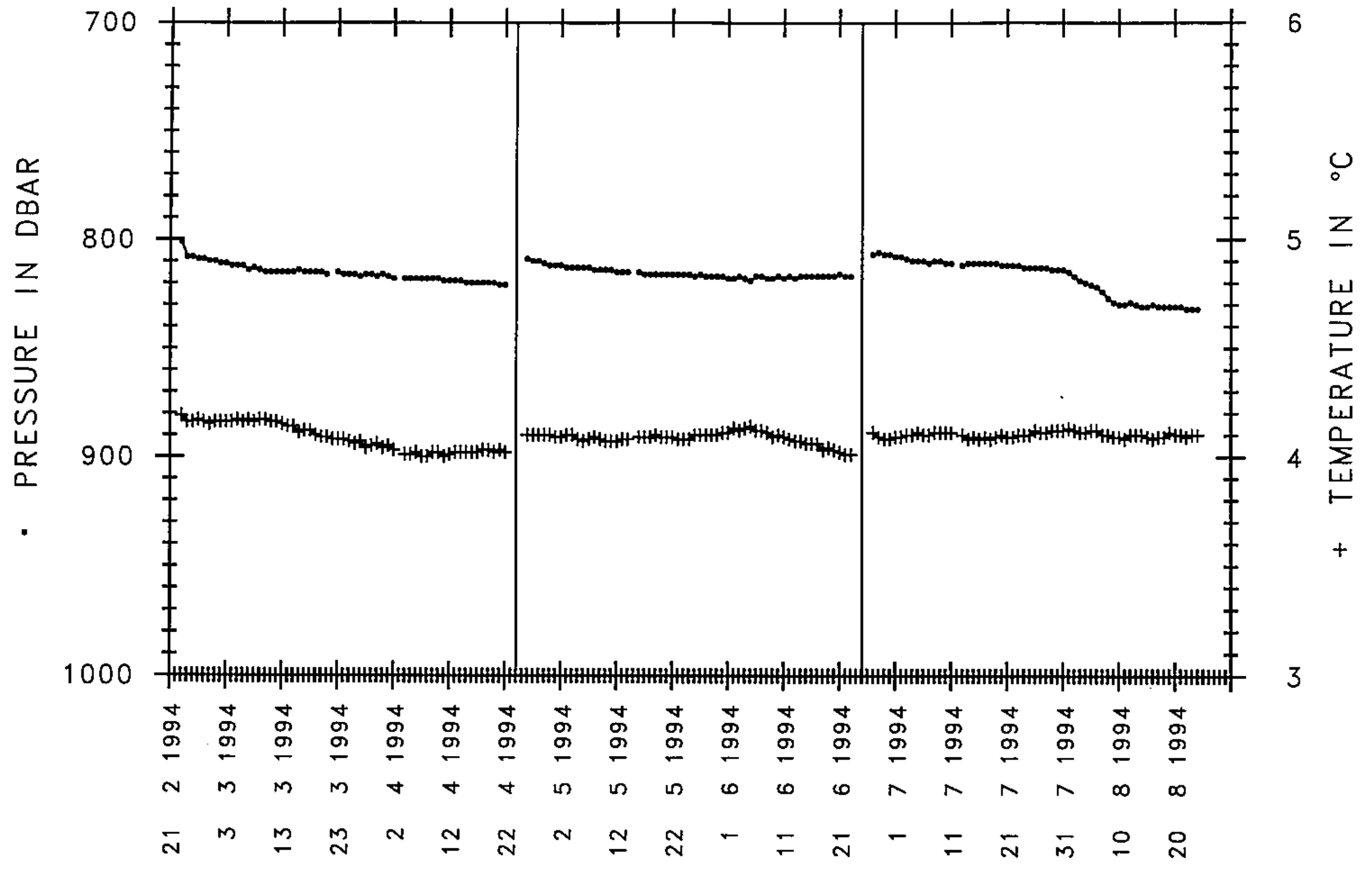
Comments:

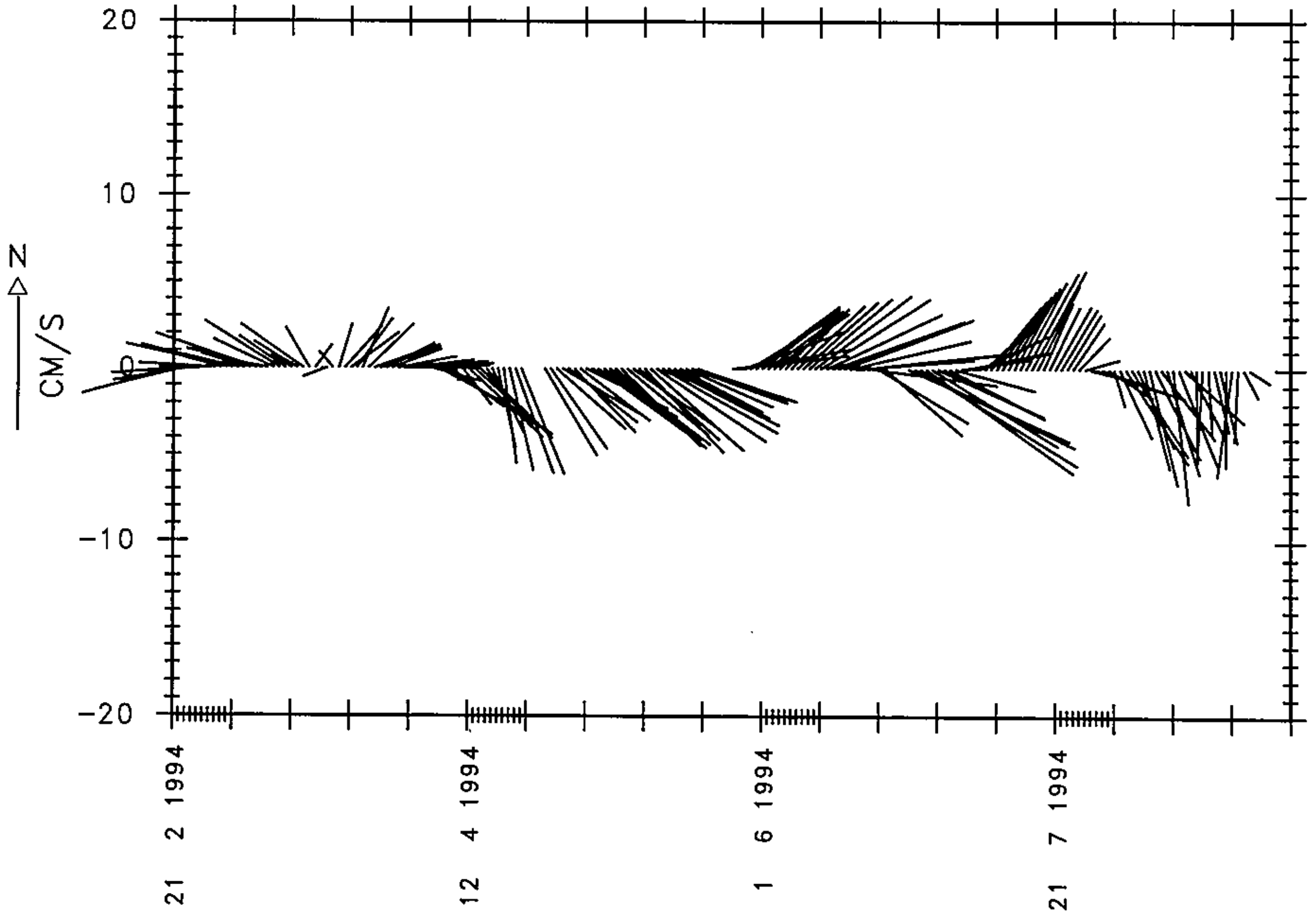


SAMBA M113 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M113 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED





SAMBA M113 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m113

launch date	launch lat	launch long
1994 2 21 4h UT	18.478 S	31.360 W

file	m113-c4.fin	m113-c5.fin	m113-c6.fin
date of 1st pos	1994 8 27 (16310)	1994 10 28 (16372)	1994 12 29 (16434)
1st pos	27.478W 19.926S	27.226W 20.591S	26.442W 21.236S
last pos	27.070W 20.406S	26.178W 21.145S	25.867W 21.740S
1st P and T	809dbar 4.23degC	792dbar 4.42degC	825dbar 4.31degC
last P and T	894dbar 3.82degC	800dbar 4.40degC	834dbar 4.34degC
displacements (East and North)	43km -53km	109km -62km	59km -56km
mean velocities (East and North)	0.83cm/s -1.05cm/s	2.13cm/s -1.21cm/s	1.17cm/s -1.10cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 162

16 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 1.52 cm/s [0.27, 2.77]
average north velocity comp.= -1.19 cm/s [-2.11, -0.27]

variances
variance of east velocity comp.= 5.57 cm2/s2 [1.71, 9.43]
variance of north velocity comp.= 3.04 cm2/s2 [0.93, 5.15]

covariance
covariance= 1.27 cm2/s2 [-0.74, 3.29]

Eddy Kinetic Energy
EKE= 4.30 cm2/s2 [2.11, 6.50]

Temperature time series statistics:

sampling interval= 24 h
number of samples= 158

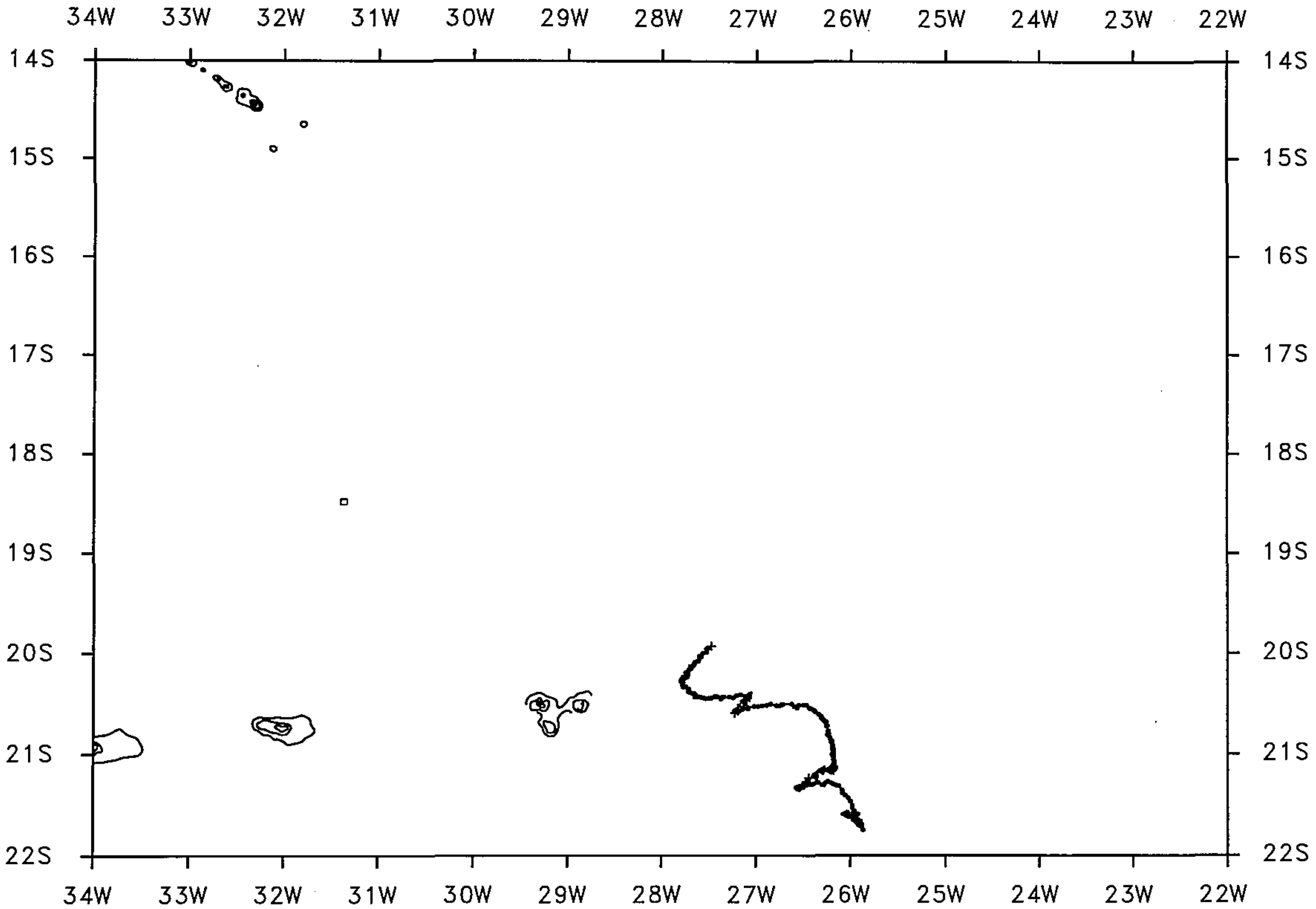
average temperature= 4.24 degC

temperature variance= 0.0299 degC*degC

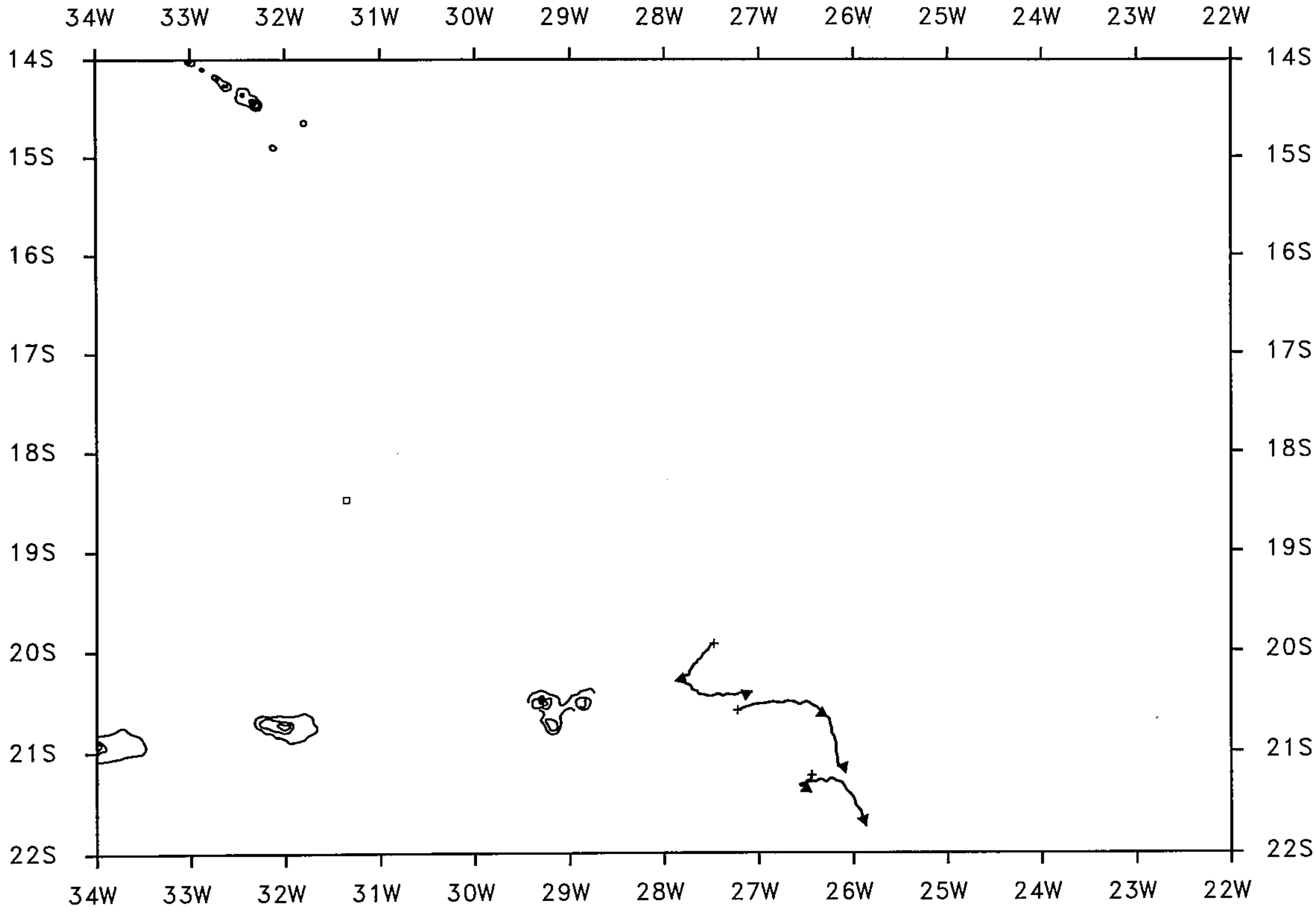
covar(u,temp)= -0.03 cm.degC/s
covar(v,temp)= -0.11 cm.degC/s

Comments:

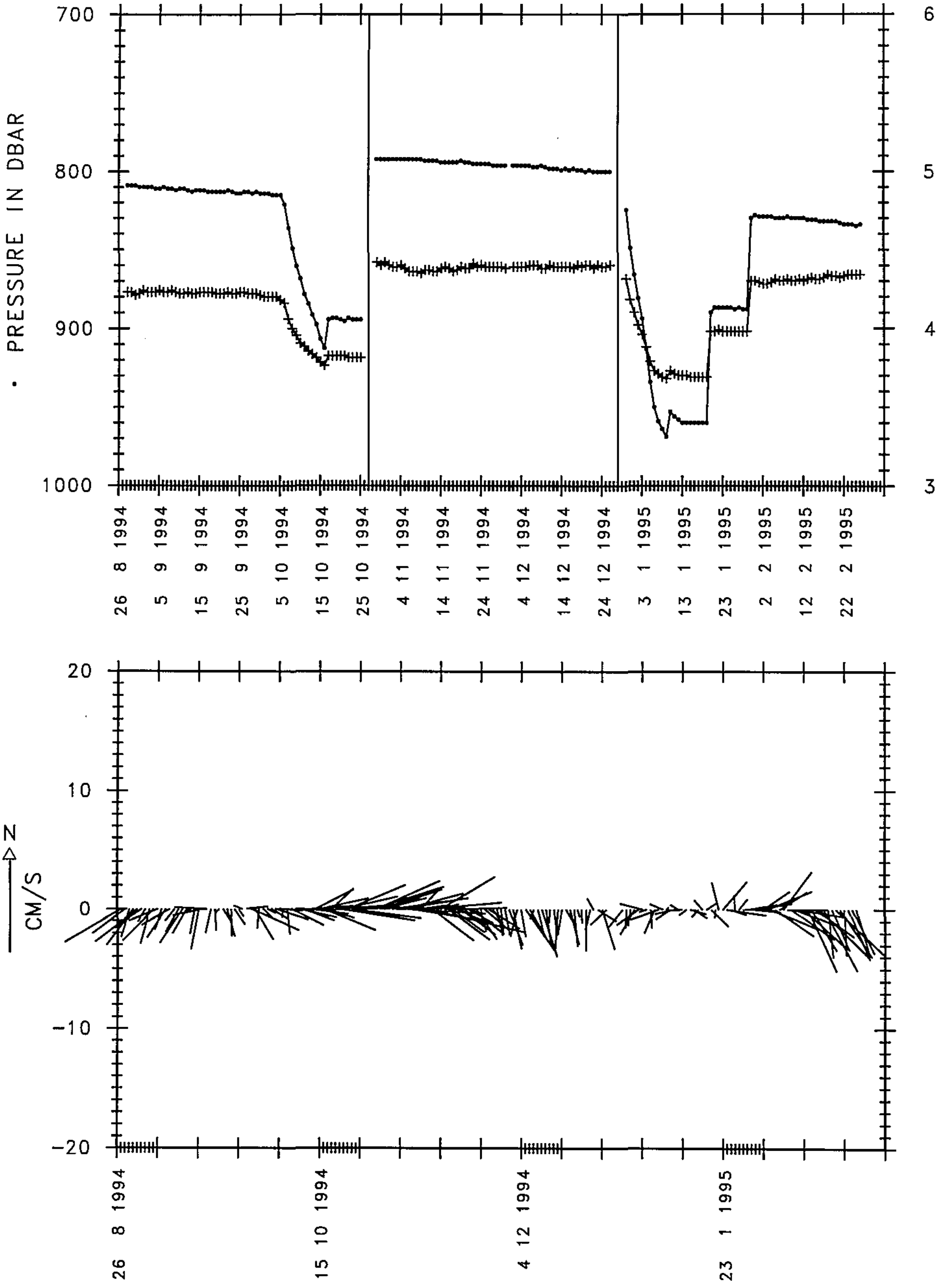
Velocity and temperature time series statistics are estimated from data within the [700,900] dbar interval.



SAMBA M113 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M113 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M113 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m113

launch date	launch lat	launch long
1994 2 21 4h UT	18.478 S	31.360 W

file	m113-c7.fin	m113-c8.fin	m113-c9.fin
date of 1st pos	1995 3 1 (16496)	1995 5 2 (16558)	1995 7 3 (16620)
1st pos	26.090W 21.591S	25.528W 22.196S	25.223W 22.139S
last pos	25.663W 22.037S	24.897W 22.343S	27.770W 22.476S
1st P and T	790dbar 4.62degC	800dbar 4.44degC	807dbar 4.39degC
last P and T	803dbar 4.37degC	808dbar 4.51degC	816dbar 4.52degC
displacements (East and North)	44km -50km	65km -16km	-262km -37km
mean velocities (East and North)	0.86cm/s -0.97cm/s	1.27cm/s -0.32cm/s	-5.14cm/s -0.73cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.03 cm/s [-2.83, 0.77]
average north velocity comp.= -0.64 cm/s [-1.92, 0.64]

variances
variance of east velocity comp.= 13.21 cm2/s2 [4.58, 21.83]
variance of north velocity comp.= 6.66 cm2/s2 [2.31, 11.01]

covariance
covariance= -0.92 cm2/s2 [-5.25, 3.42]

Eddy Kinetic Energy
EKE= 9.93 cm2/s2 [5.10, 14.76]

Temperature time series statistics:

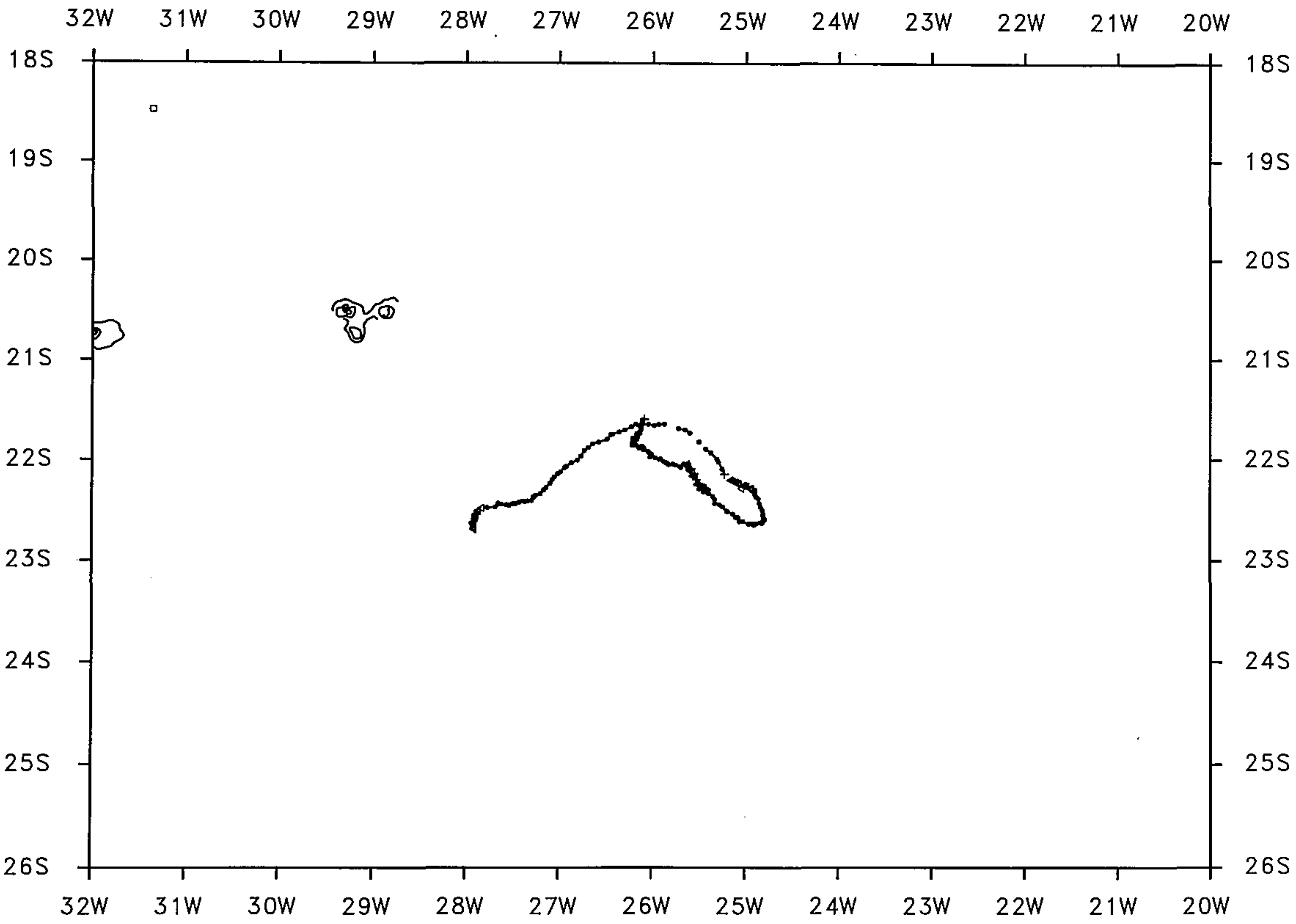
sampling interval= 24 h
number of samples= 174

average temperature= 4.49 degC

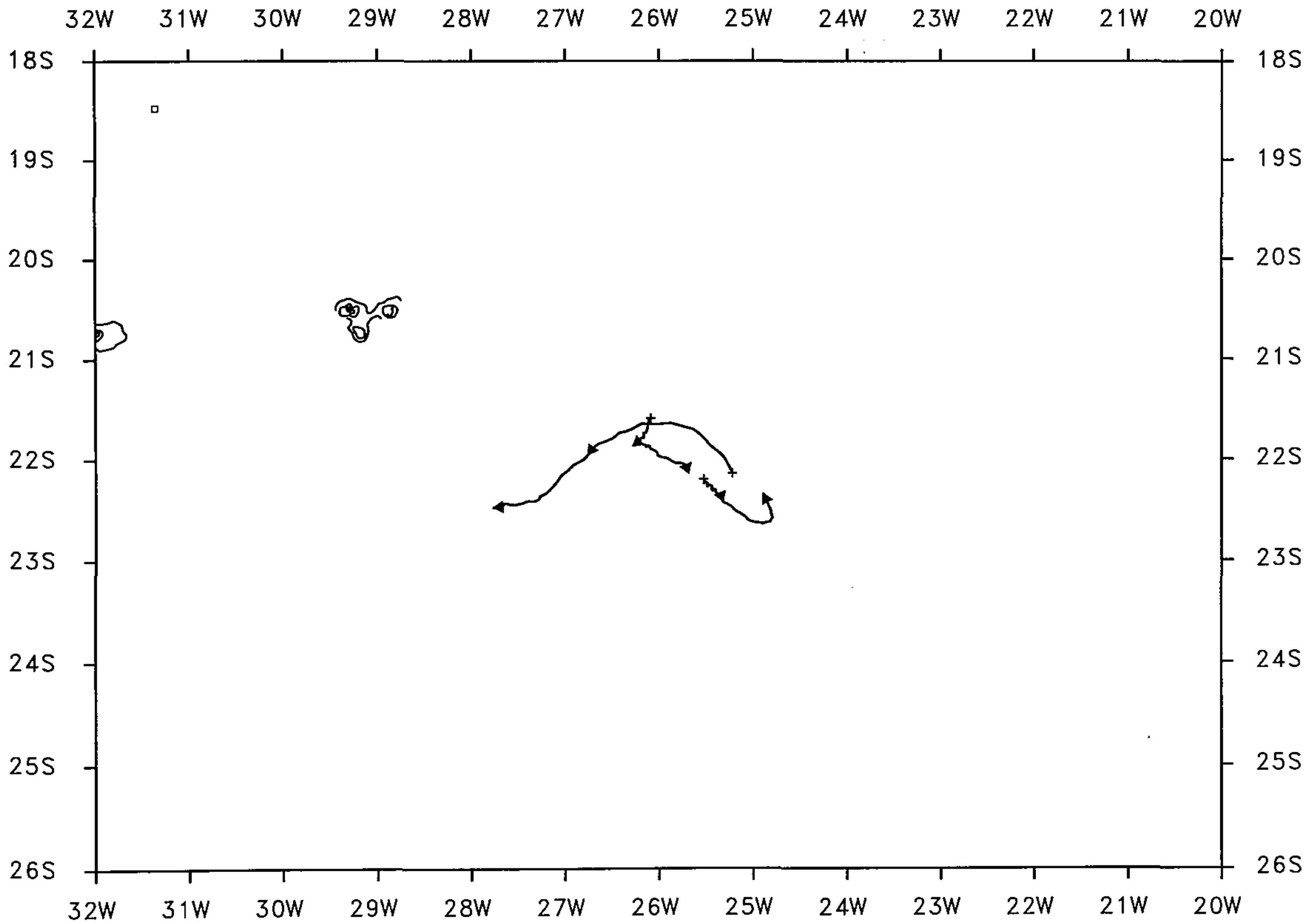
temperature variance= 0.0070 degC*degC

covar(u,temp)= 0.07 cm.degC/s
covar(v,temp)= -0.05 cm.degC/s

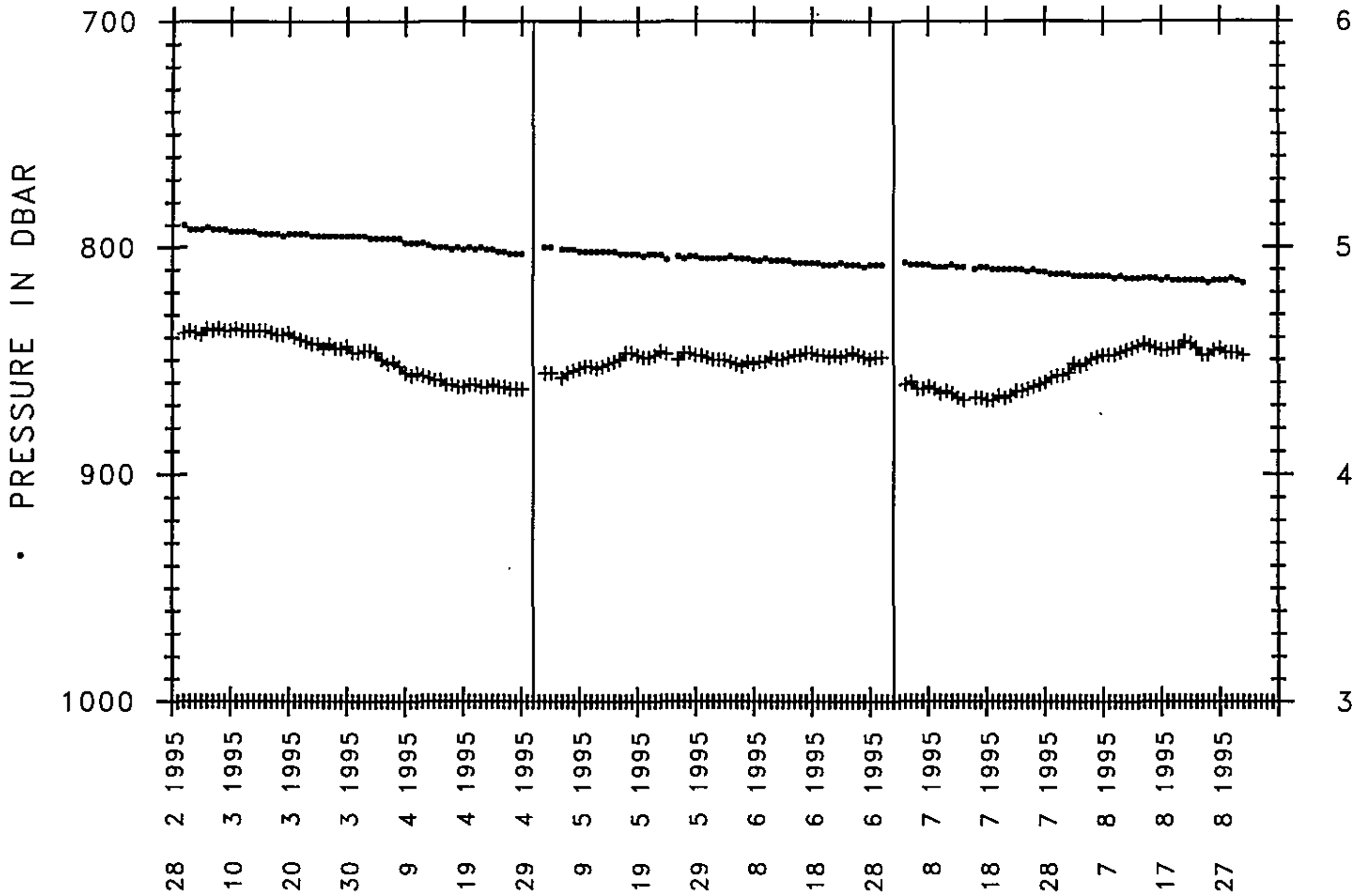
Comments:

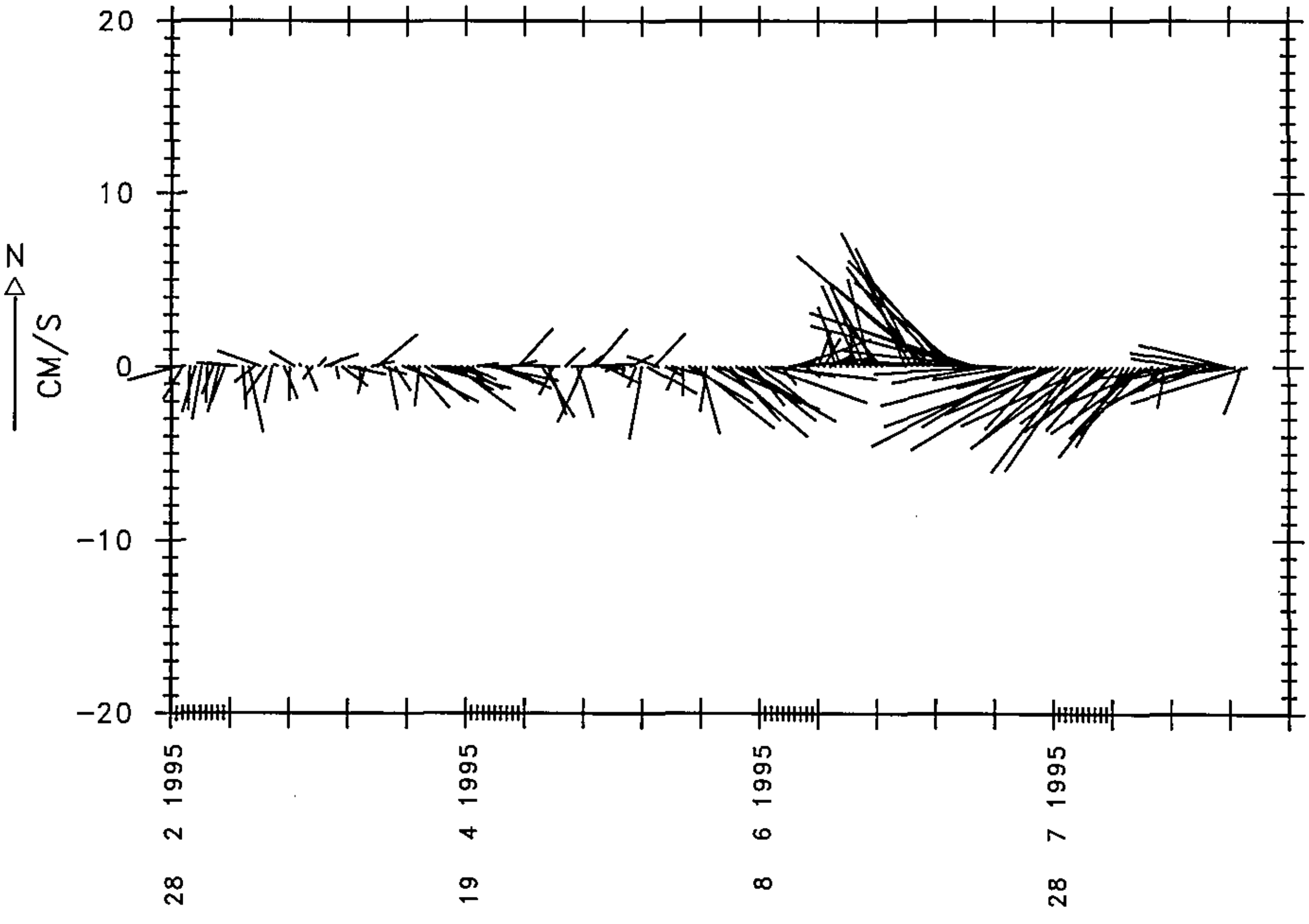


SAMBA M113 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M113 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M113 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #114

LAUNCHED AT: 18°30.1'S 31°06.0'W on 21/02/1994 05h24 UT

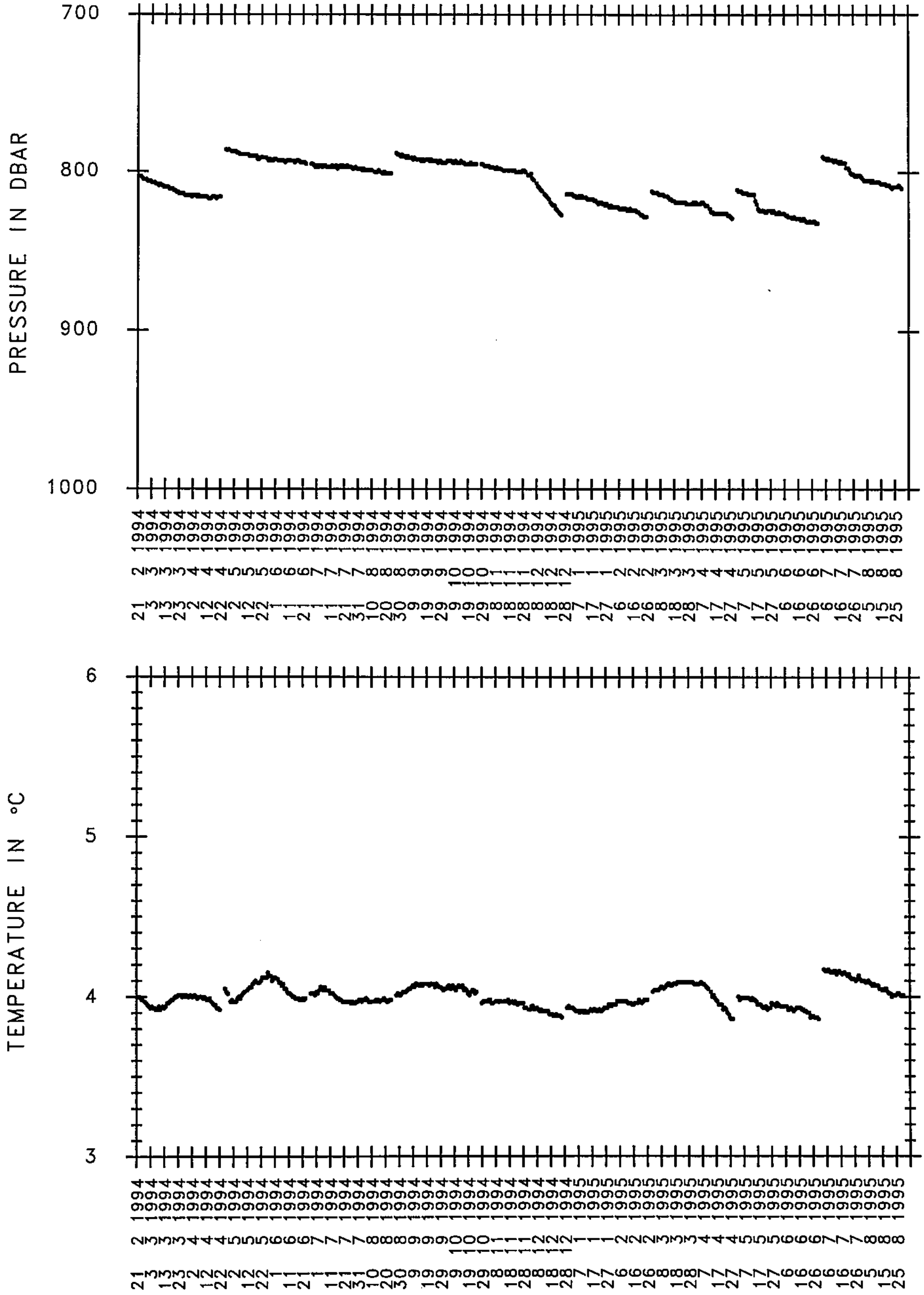
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

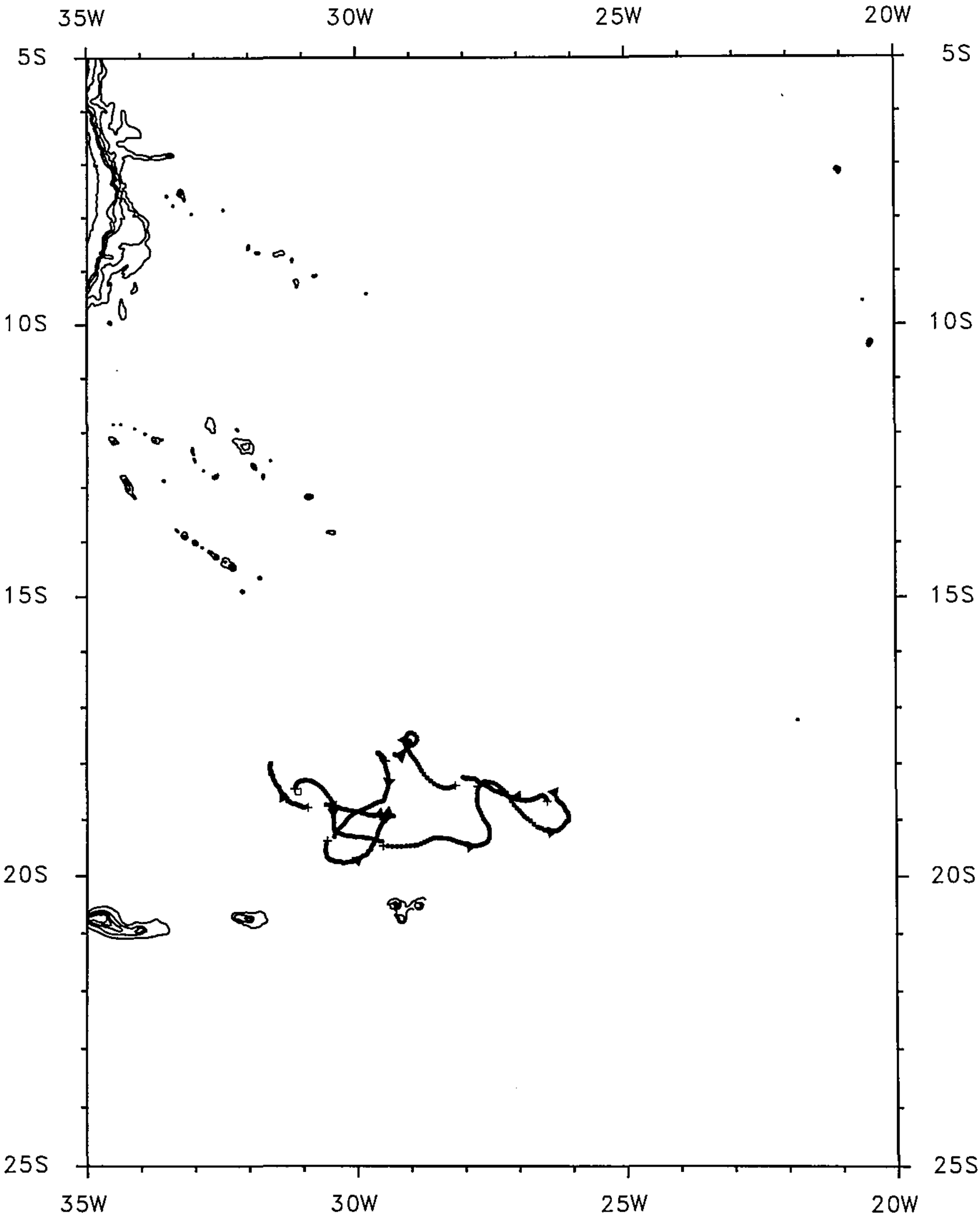
This float showed almost no mean motion over 1.5 year, but a mainly zonal turbulent diffusion.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m114-c1.raw	m114-c1.fin	m114-c1.diaric
m114-c2.raw	m114-c2.fin	m114-c2.diaric
m114-c3.raw	m114-c3.fin	m114-c3.diaric
m114-c4.raw	m114-c4.fin	m114-c4.diaric
m114-c5.raw	m114-c5.fin	m114-c5.diaric
m114-c6.raw	m114-c6.fin	m114-c6.diaric
m114-c7.raw	m114-c7.fin	m114-c7.diaric
m114-c8.raw	m114-c8.fin	m114-c8.diaric
m114-c9.raw	m114-c9.fin	m114-c9.diaric



SAMBA M114 CYCLES 1 TO 9



SAMBA M114 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m114

launch date	launch lat	launch long
1994 2 21 5h UT	18.502 S	31.100 W

file	m114-c1.fin	m114-c2.fin	m114-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 25 (16186)	1994 6 26 (16248)
1st pos	31.161W 18.450S	29.519W 19.462S	27.759W 18.403S
last pos	29.547W 19.383S	27.635W 18.316S	26.299W 18.620S
1st P and T	803dbar 4.00degC	786dbar 4.05degC	795dbar 4.02degC
last P and T	816dbar 3.92degC	795dbar 3.99degC	801dbar 3.98degC
displacements (East and North)	170km -104km	198km 127km	154km -24km
mean velocities (East and North)	3.39cm/s -2.07cm/s	3.95cm/s 2.54cm/s	3.02cm/s -0.47cm/s
number of pos	59	59	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 178

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 3.46 cm/s [1.76, 5.16]
average north velocity comp.= 0.01 cm/s [-1.89, 1.91]

variances
variance of east velocity comp.= 11.81 cm2/s2 [4.10, 19.53]
variance of north velocity comp.= 14.72 cm2/s2 [5.10, 24.34]

covariance
covariance= -5.59 cm2/s2 [-11.68, 0.50]

Eddy Kinetic Energy
EKE= 13.27 cm2/s2 [7.10, 19.44]

Temperature time series statistics:

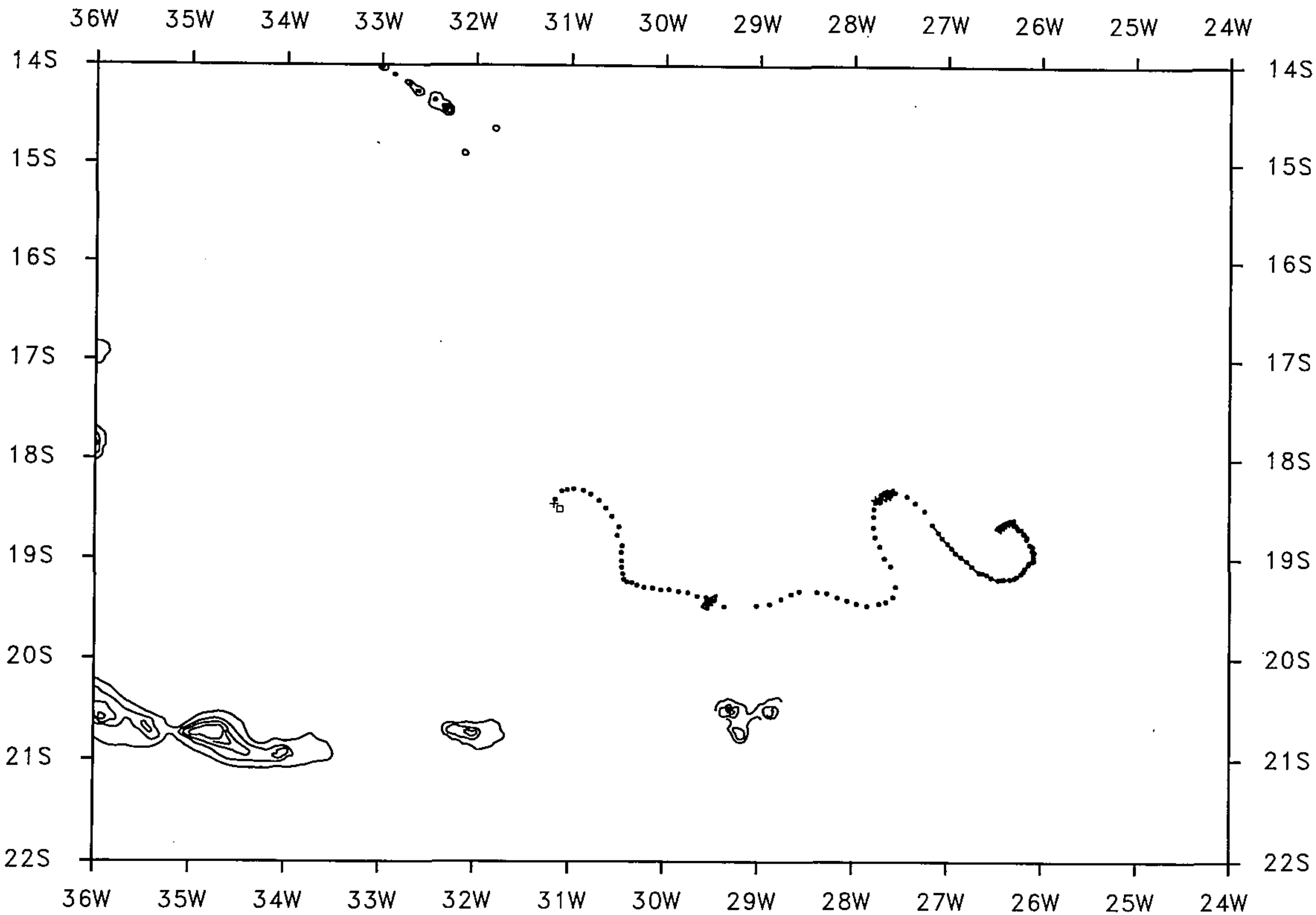
sampling interval= 24 h
number of samples= 169

average temperature= 4.00 degC

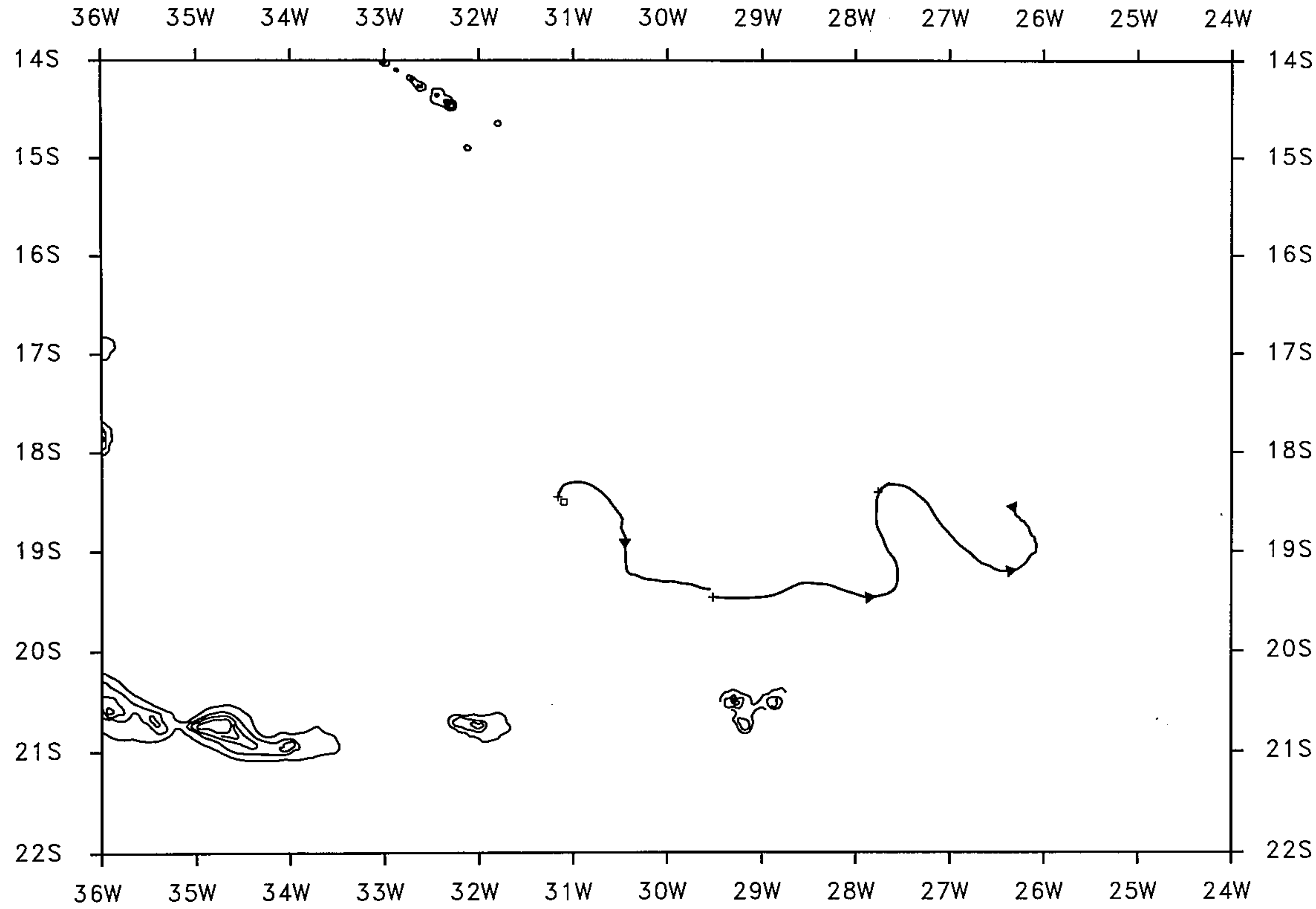
temperature variance= 0.0025 degC*degC

covar(u,temp)= 0.00 cm.degC/s
covar(v,temp)= 0.03 cm.degC/s

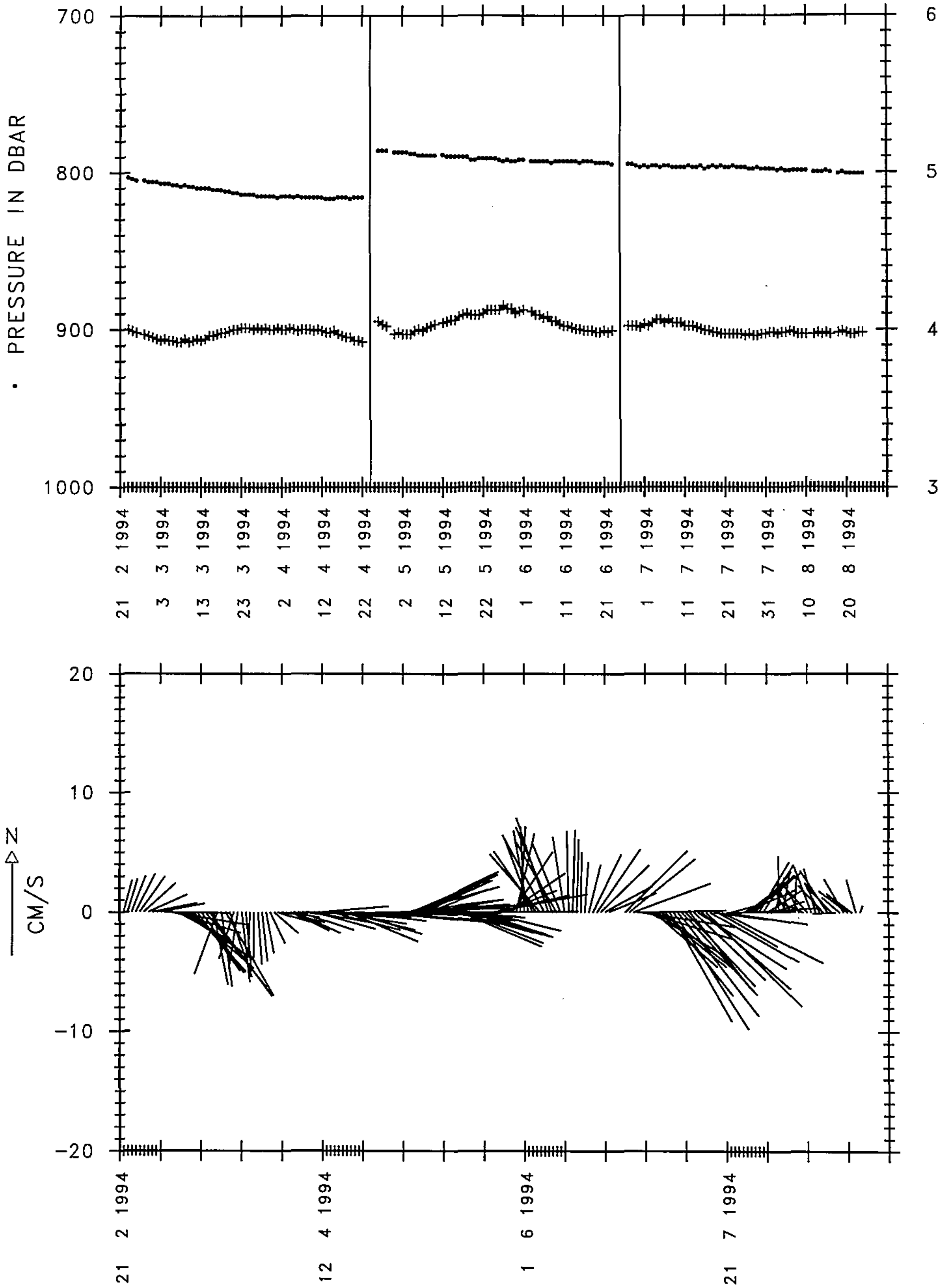
Comments:



SAMBA M114 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M114 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M114 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m114

launch date	launch lat	launch long
1994 2 21 5h UT	18.502 S	31.100 W

file	m114-c4.fin	m114-c5.fin	m114-c6.fin
date of 1st pos	1994 8 27 (16310)	1994 10 28 (16372)	1994 12 29 (16434)
1st pos	26.472W 18.664S	28.167W 18.387S	29.479W 17.954S
last pos	28.043W 18.245S	29.296W 17.841S	30.427W 19.304S
1st P and T	788dbar 4.01degC	795dbar 3.96degC	814dbar 3.93degC
last P and T	795dbar 4.03degC	827dbar 3.87degC	828dbar 3.98degC
displacements (East and North)	-166km 47km	-119km 61km	-100km -150km
mean velocities (East and North)	-3.30cm/s 0.93cm/s	-2.34cm/s 1.19cm/s	-2.06cm/s -3.10cm/s
number of pos	59	60	57

Velocity time series statistics:

sampling interval= 24 h
number of samples= 176

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -2.57 cm/s [-3.89, -1.26]
average north velocity comp.= -0.27 cm/s [-2.02, 1.47]

variances
variance of east velocity comp.= 7.08 cm2/s2 [2.46, 11.71]
variance of north velocity comp.= 12.43 cm2/s2 [4.31, 20.55]

covariance
covariance= -2.41 cm2/s2 [-6.75, 1.92]

Eddy Kinetic Energy
EKE= 9.76 cm2/s2 [5.08, 14.43]

Temperature time series statistics:

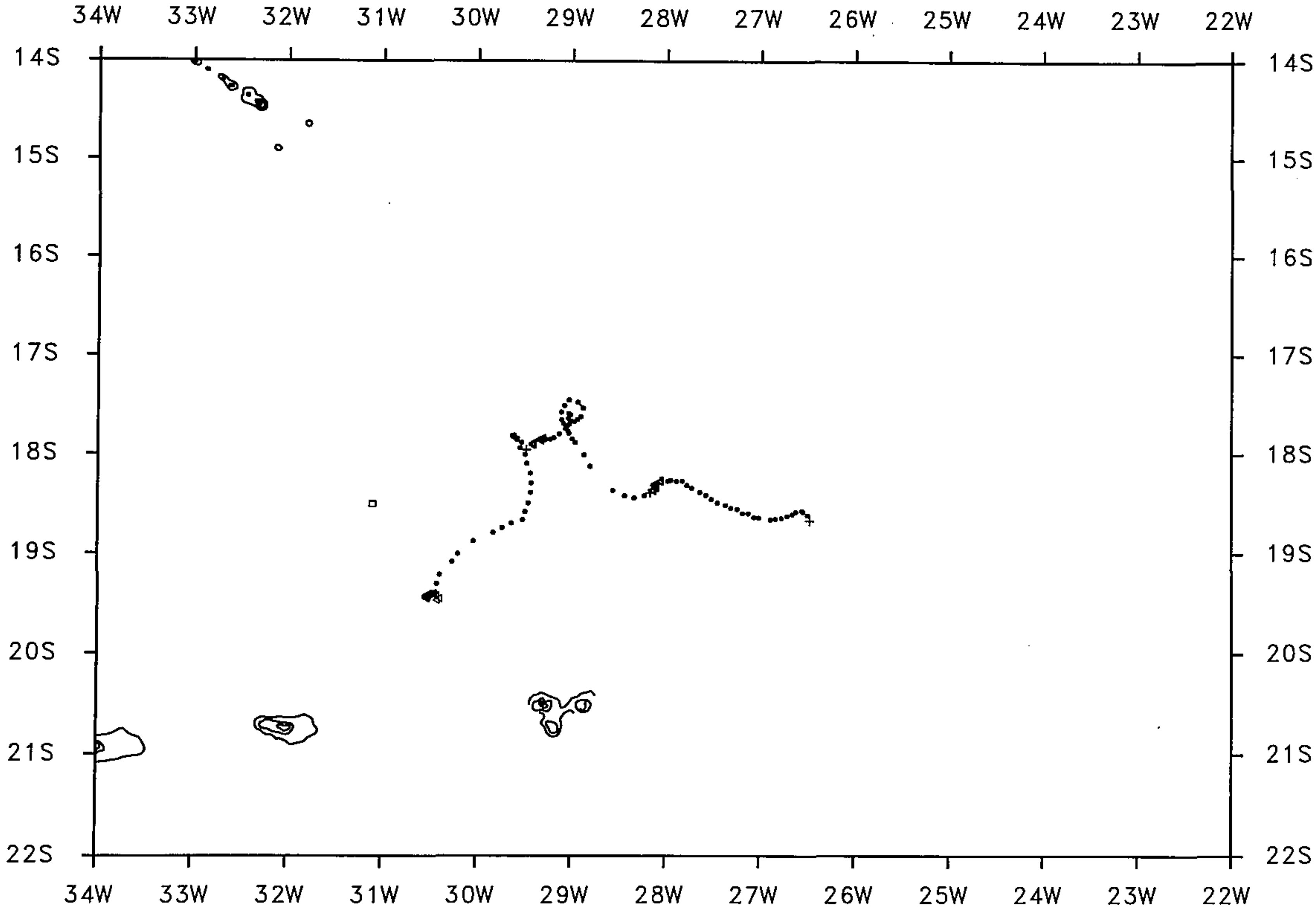
sampling interval= 24 h
number of samples= 165

average temperature= 3.98 degC

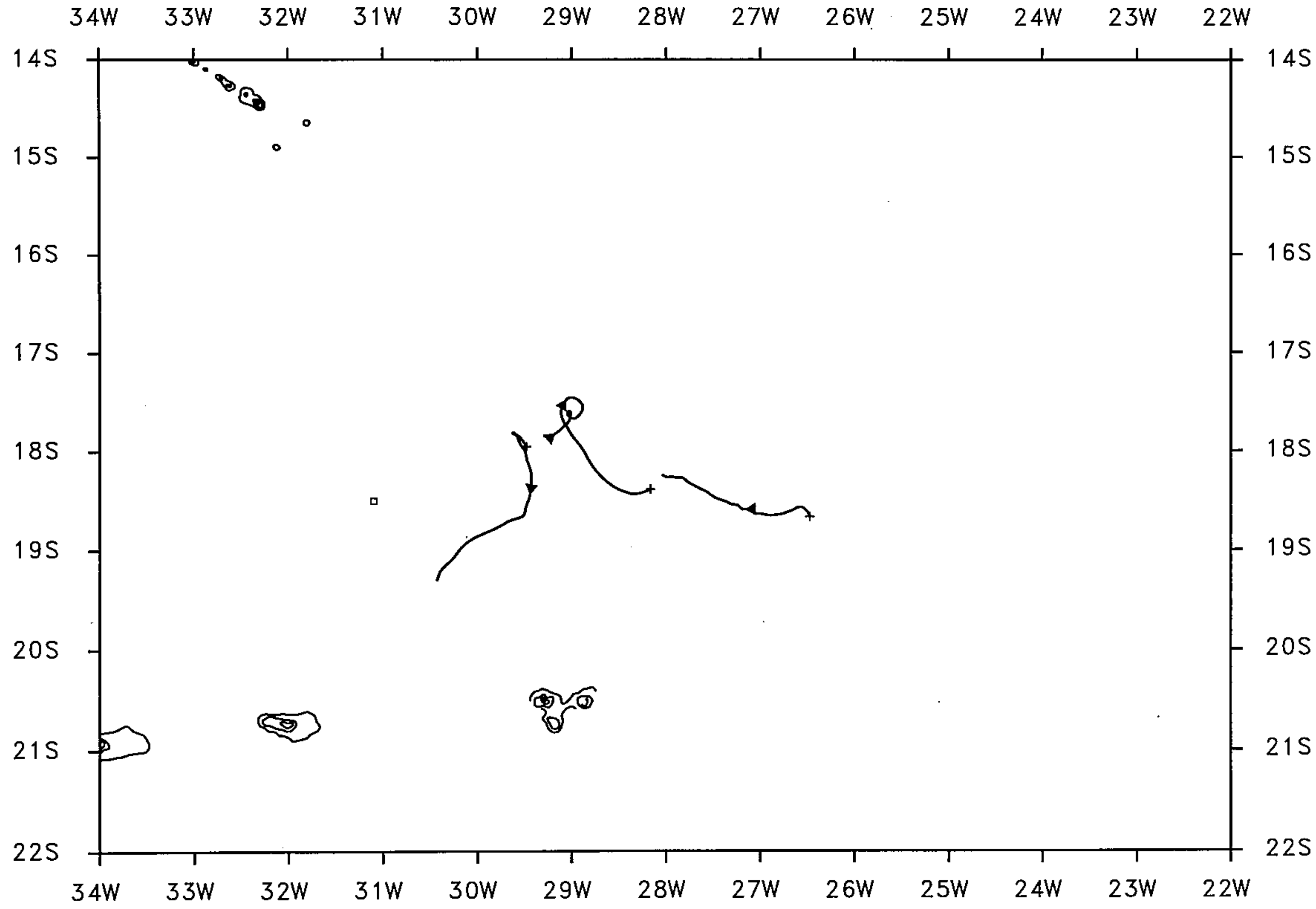
temperature variance= 0.0038 degC*degC

covar(u,temp)= -0.06 cm.degC/s
covar(v,temp)= 0.07 cm.degC/s

Comments:

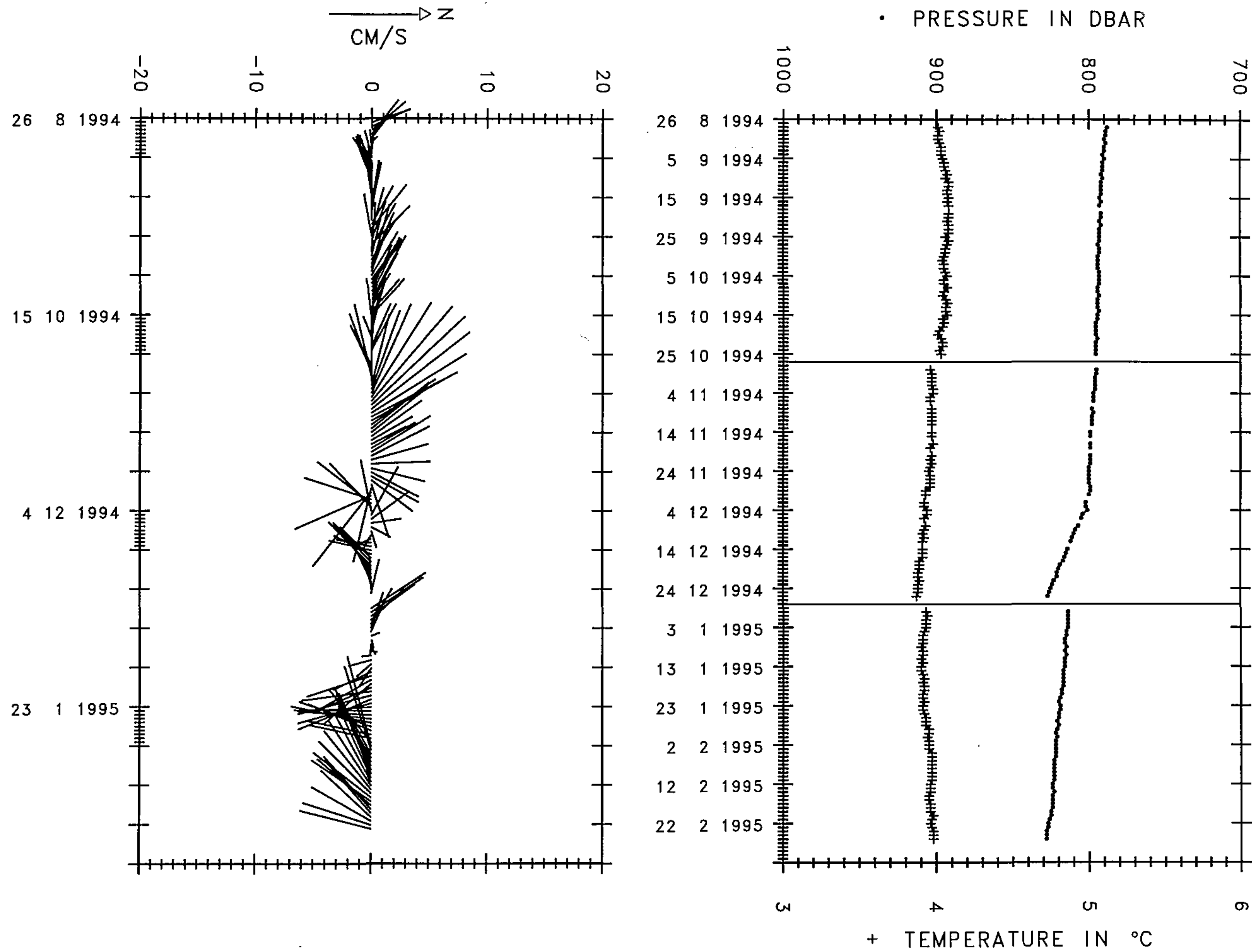


SAMBA M114 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M114 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED

SAMBA M114 CYCLES 4,5 AND 6



EXPERIMENT: SAMBA

FLOAT: m114
----

launch date	launch lat	launch long
1994 2 21 5h UT	18.502 S	31.100 W

file	m114-c7.fin	m114-c8.fin	m114-c9.fin
date of 1st pos	1995 3 1 (16496)	1995 5 2 (16558)	1995 7 3 (16620)
1st pos	30.553W 19.379S	29.519W 18.993S	30.899W 18.780S
last pos	29.332W 18.937S	30.583W 18.732S	31.590W 18.002S
1st P and T	812dbar 4.03degC	811dbar 4.00degC	790dbar 4.17degC
last P and T	829dbar 3.86degC	832dbar 3.86degC	810dbar 4.01degC
displacements (East and North)	128km 49km	-112km 29km	-73km 86km
mean velocities (East and North)	2.51cm/s 0.96cm/s	-2.19cm/s 0.57cm/s	-1.45cm/s 1.73cm/s
number of pos	60	60	59

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 179

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.40 cm/s [-1.76, 0.96]
average north velocity comp.= 1.05 cm/s [-0.04, 2.14]

variances
variance of east velocity comp.= 7.53 cm2/s2 [2.61, 12.45]
variance of north velocity comp.= 4.85 cm2/s2 [1.68, 8.03]

covariance
covariance= 0.44 cm2/s2 [-2.35, 3.24]

Eddy Kinetic Energy
EKE= 6.19 cm2/s2 [3.27, 9.12]

Temperature time series statistics:
----

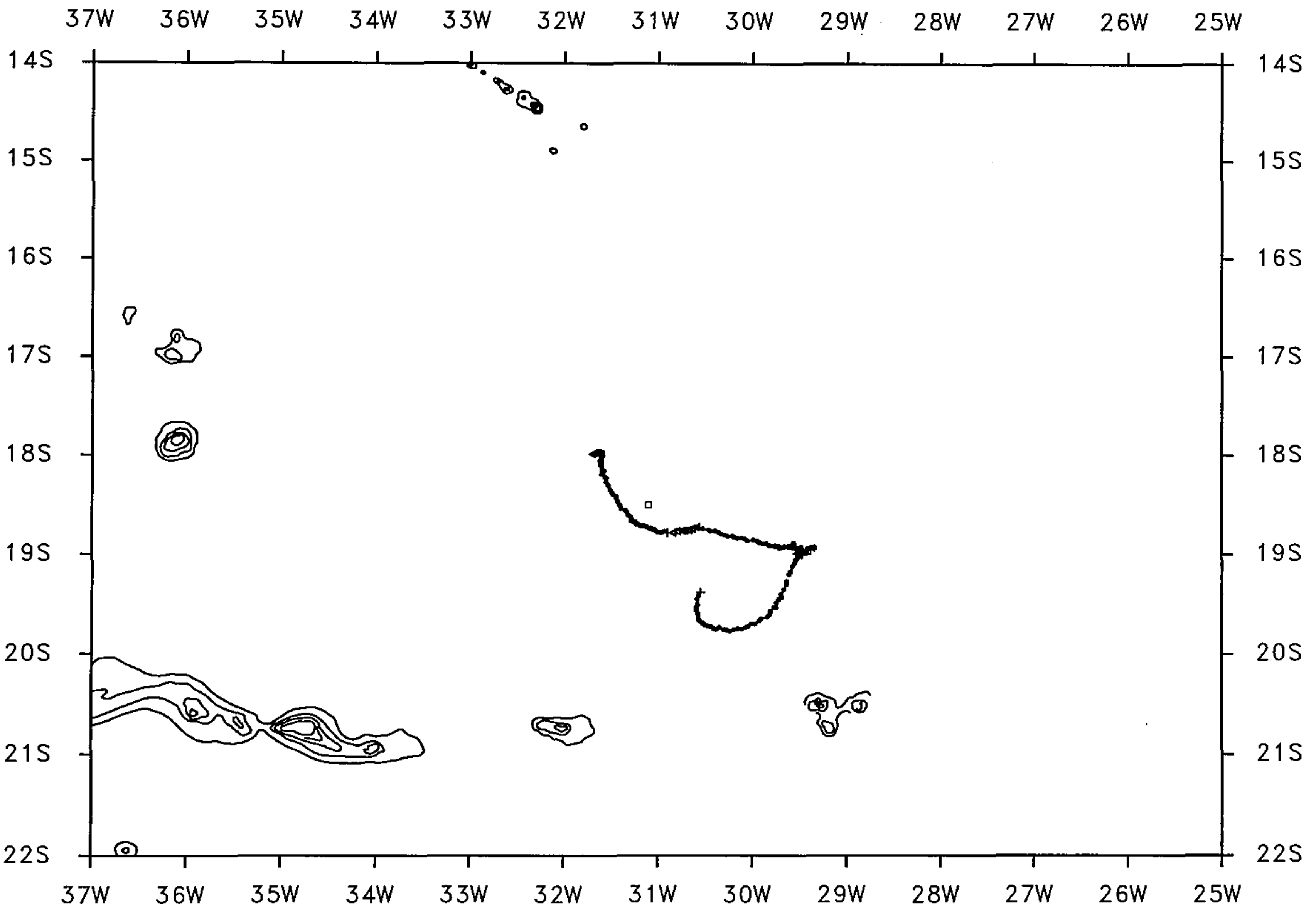
sampling interval= 24 h
number of samples= 175

average temperature= 4.02 degC

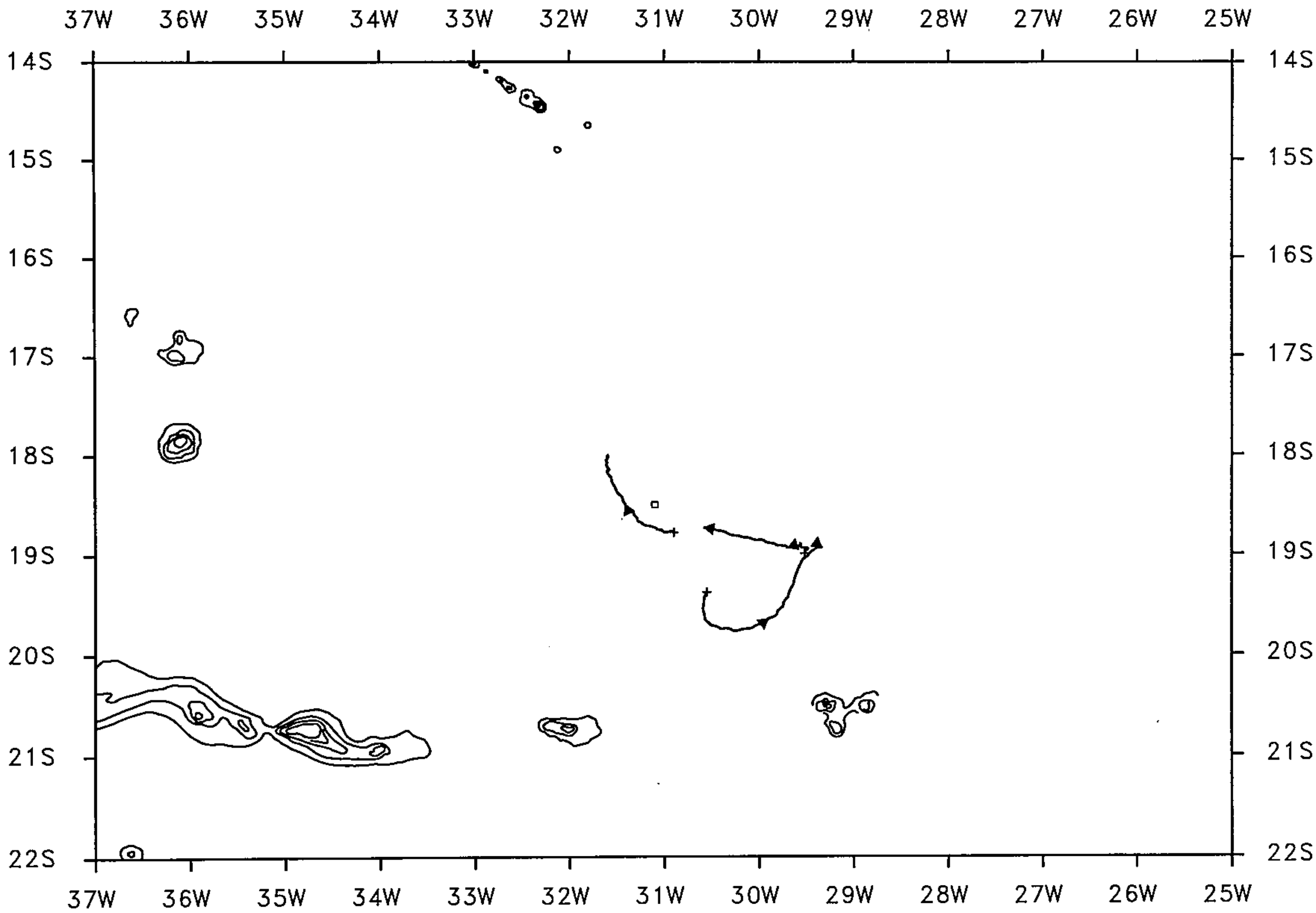
temperature variance= 0.0070 degC*degC

covar(u,temp)= 0.06 cm.degC/s
covar(v,temp)= 0.02 cm.degC/s

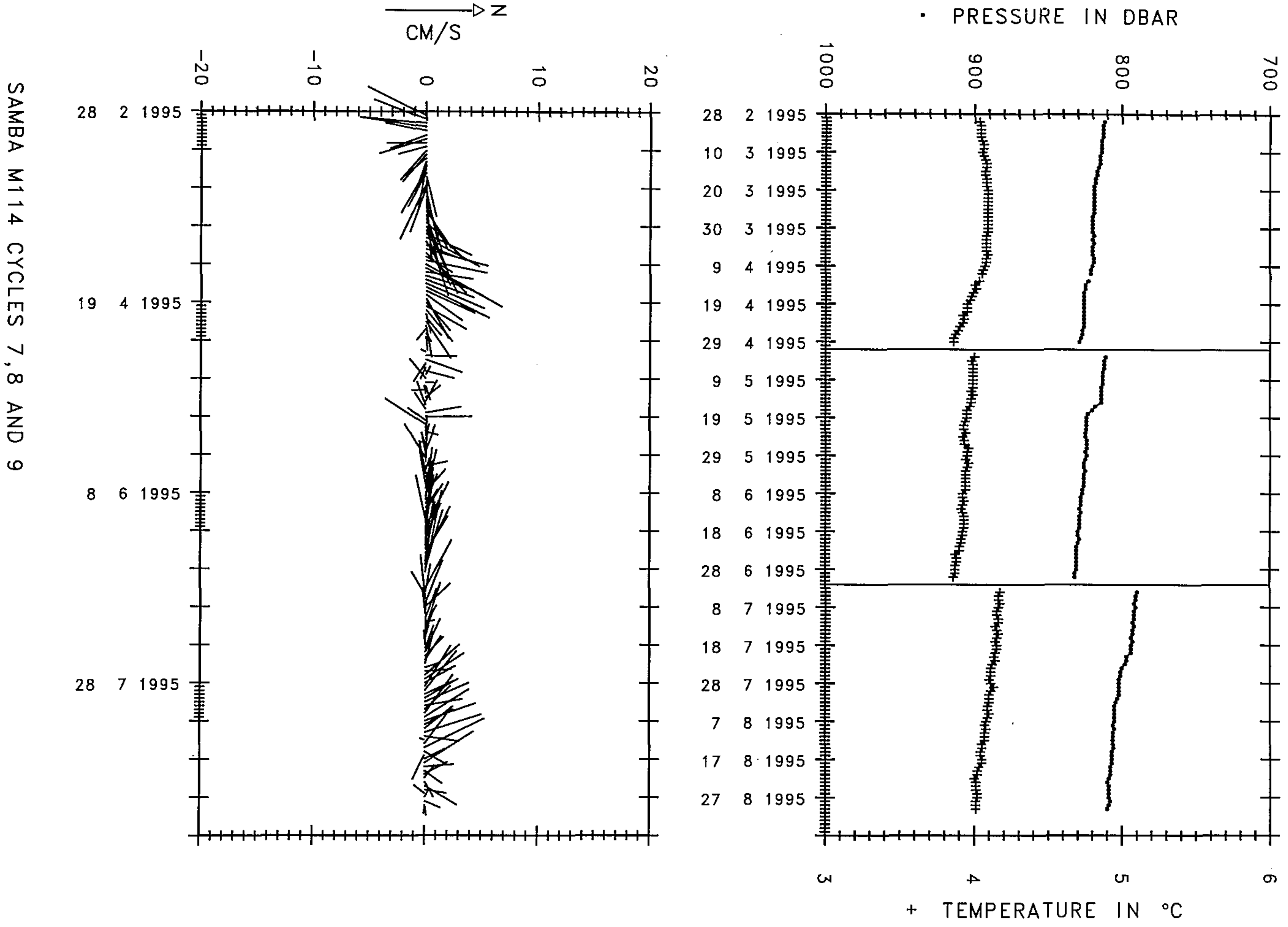
Comments:



SAMBA M114 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M114 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M114 CYCLES 7,8 AND 9
CM/S
N
-20
-10
0
10
20
28 2 1995
19 4 1995
8 6 1995
28 7 1995
PRESSURE IN DBAR
1000
900
800
700
28 2 1995
10 3 1995
20 3 1995
30 3 1995
9 4 1995
19 4 1995
29 4 1995
9 5 1995
19 5 1995
29 5 1995
8 6 1995
18 6 1995
28 6 1995
8 7 1995
18 7 1995
28 7 1995
7 8 1995
17 8 1995
27 8 1995
3
4
5
6
+ TEMPERATURE IN °C

EXPERIMENT: SAMBA
FLOAT: MARVOR #115

LAUNCHED AT: 18°16.4'S 31°20.0'W on 21/02/1994 07h22 UT

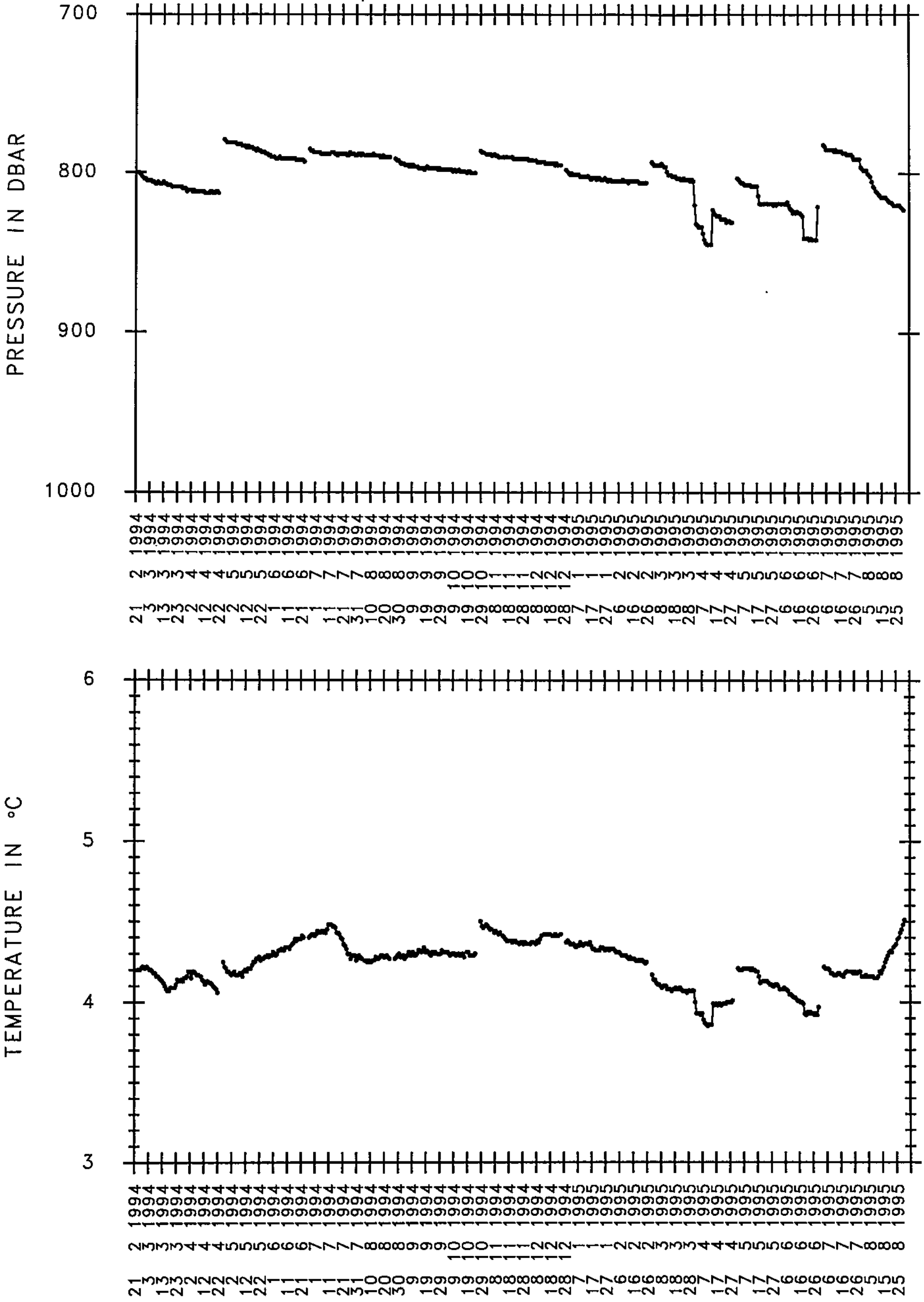
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

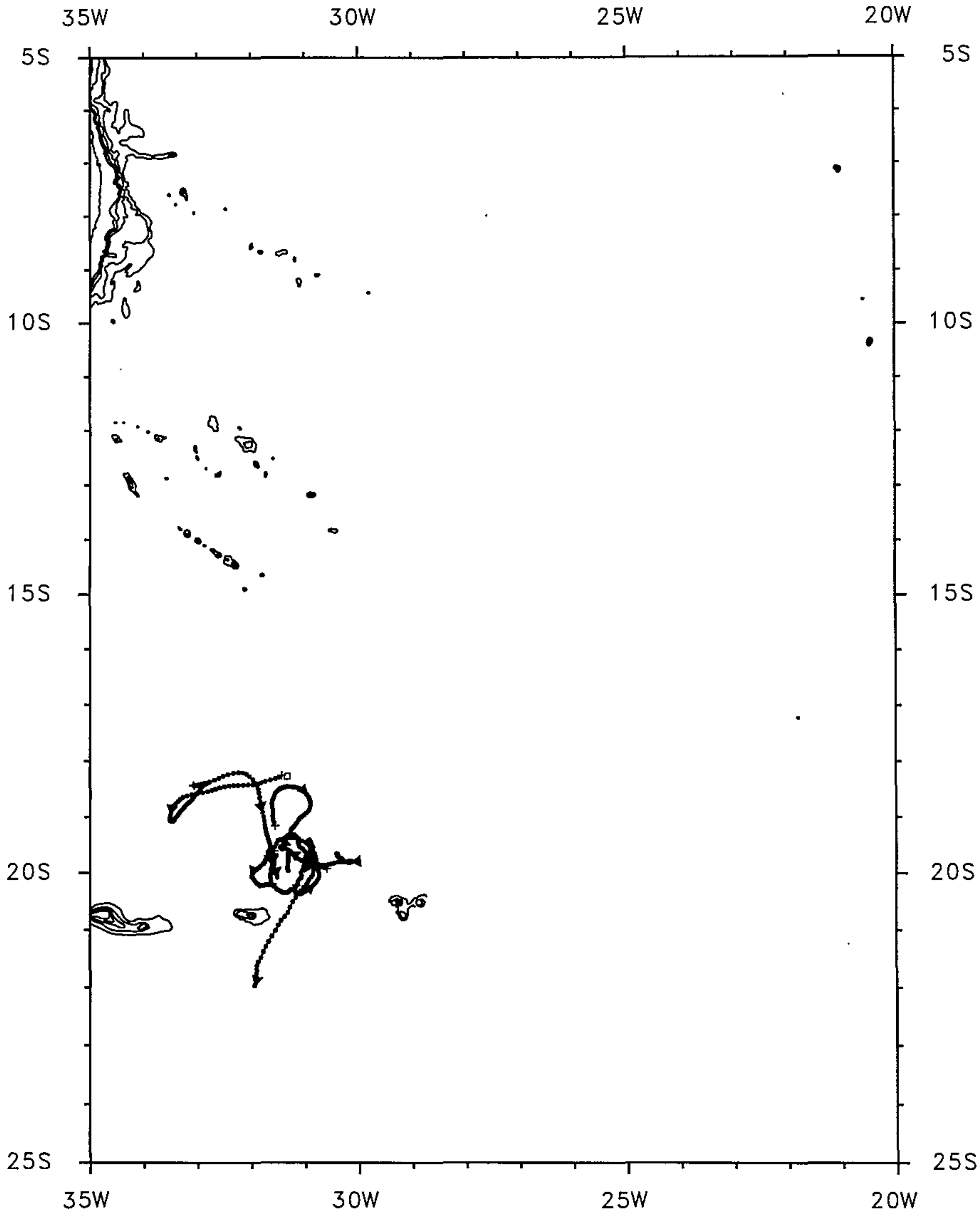
This float showed a mainly mesoscale turbulent character, and finally managed to cross southward the Vitoria-Trindade chain between Trindade and Martin Vaz islands. Exchange of water between regions north and south of the chain is thus possible, besides the western boundary (see also float #113).

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m115-c1.raw	m115-c1.fin	m115-c1.diaric
m115-c2.raw	m115-c2.fin	m115-c2.diaric
m115-c3.raw	m115-c3.fin	m115-c3.diaric
m115-c4.raw	m115-c4.fin	m115-c4.diaric
m115-c5.raw	m115-c5.fin	m115-c5.diaric
m115-c6.raw	m115-c6.fin	m115-c6.diaric
m115-c7.raw	m115-c7.fin	m115-c7.diaric
m115-c8.raw	m115-c8.fin	m115-c8.diaric
m115-c9.raw	m115-c9.fin	m115-c9.diaric



SAMBA M115 CYCLES 1 TO 9



SAMBA M115 (FEBRUARY 1994 – AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m115
----

launch date	launch lat	launch long
1994 2 21 7h UT	18.273 S	31.333 W

file	m115-c1.fin	m115-c2.fin	m115-c3.fin
date of 1st pos	1994 2 22 (16124)	1994 4 27 (16188)	1994 6 26 (16248)
1st pos	31.435W 18.255S	33.073W 18.434S	31.611W 20.191S
last pos	32.819W 18.392S	31.525W 20.076S	30.859W 19.541S
1st P and T	800dbar 4.20degC	779dbar 4.25degC	785dbar 4.40degC
last P and T	813dbar 4.06degC	793dbar 4.40degC	790dbar 4.27degC
displacements (East and North)	-146km -15km	162km -182km	79km 72km
mean velocities (East and North)	-2.91cm/s -0.30cm/s	3.30cm/s -3.70cm/s	1.57cm/s 1.44cm/s
number of pos	59	58	59

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 176

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.63 cm/s [-1.88, 3.14]
average north velocity comp.= -0.85 cm/s [-2.93, 1.23]

variances
variance of east velocity comp.= 25.73 cm2/s2 [8.92, 42.54]
variance of north velocity comp.= 17.64 cm2/s2 [6.11, 29.16]

covariance
covariance= 5.37 cm2/s2 [-4.48, 15.21]

Eddy Kinetic Energy
EKE= 21.68 cm2/s2 [11.49, 31.87]

Temperature time series statistics:
----

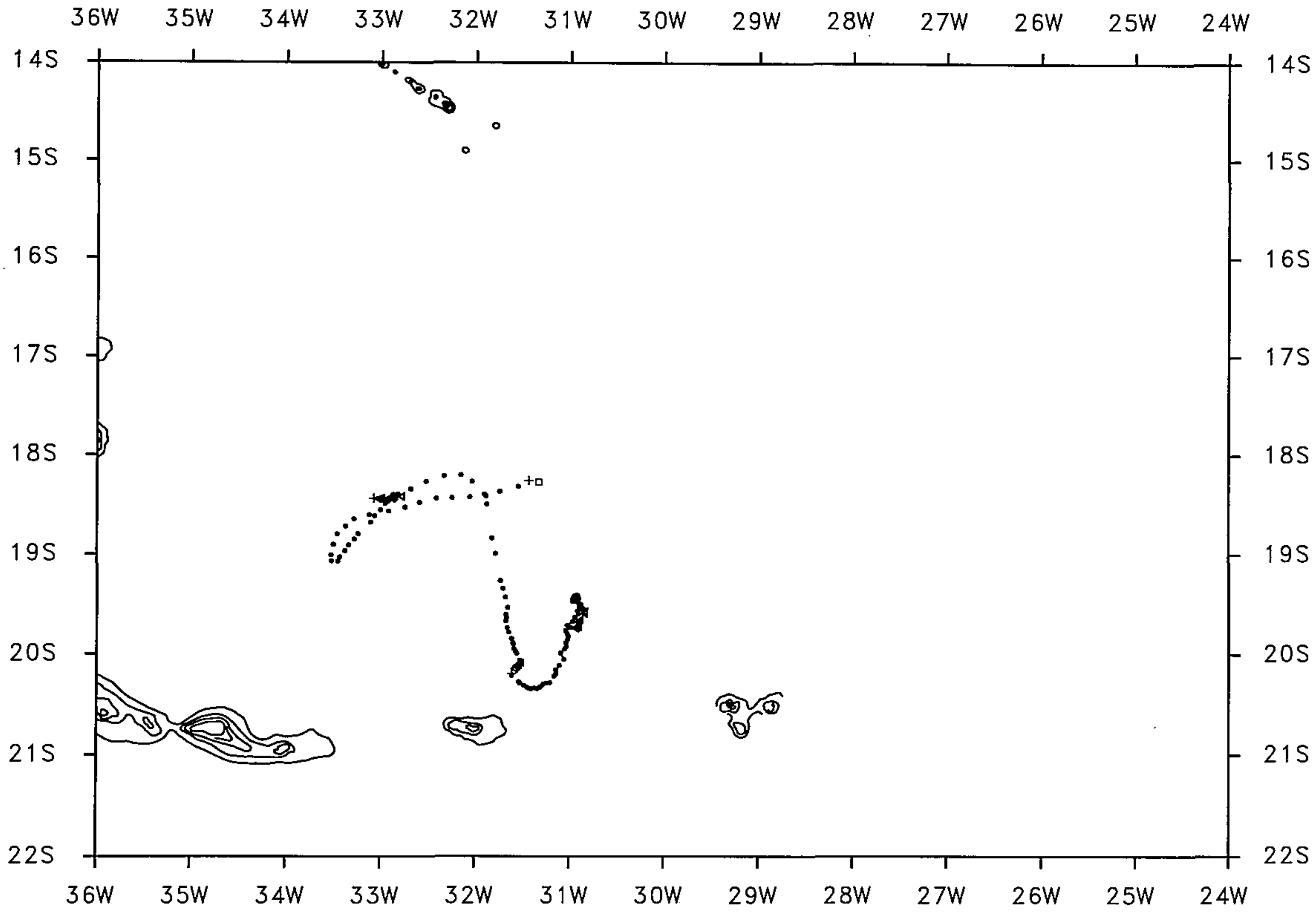
sampling interval= 24 h
number of samples= 171

average temperature= 4.26 degC

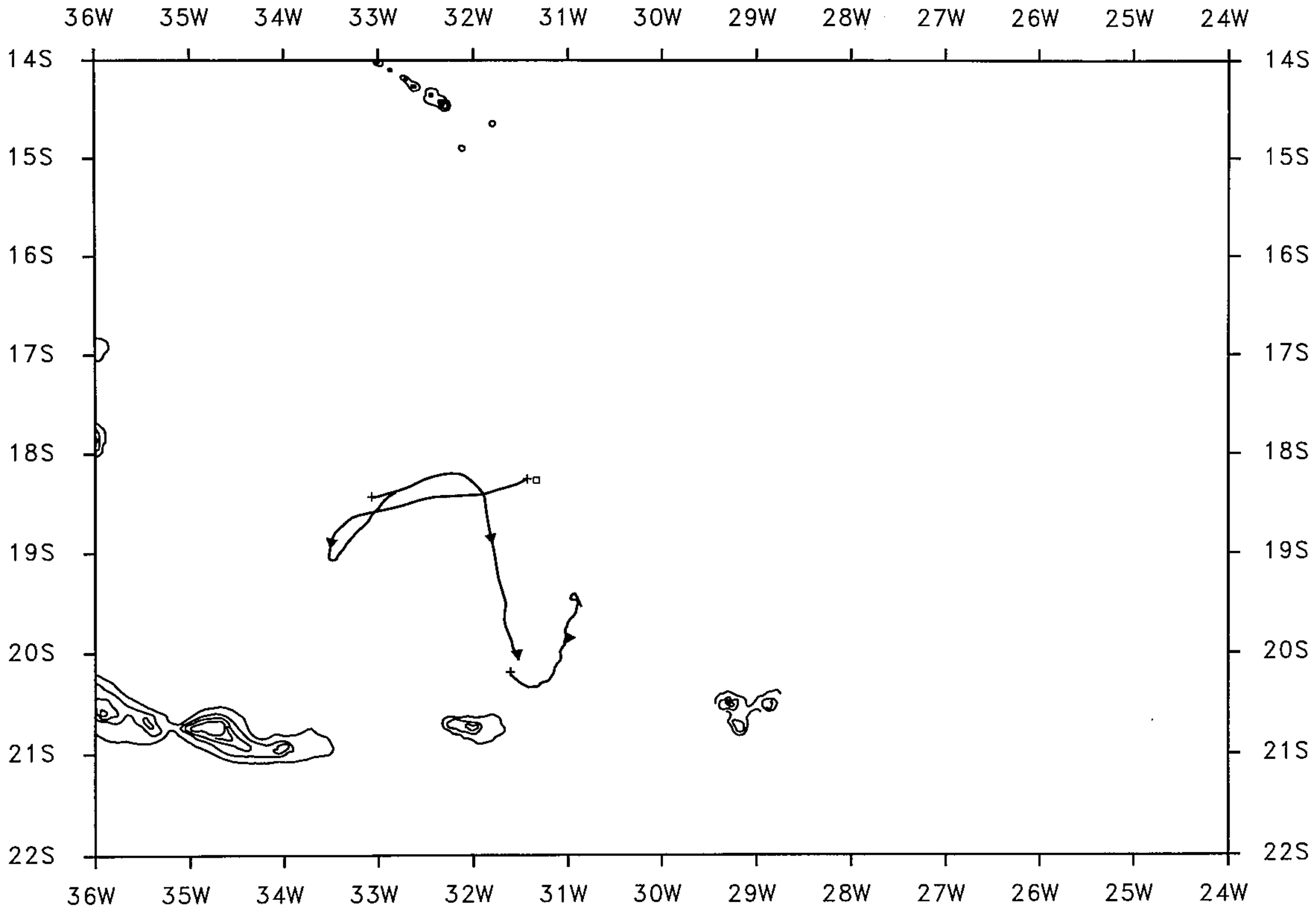
temperature variance= 0.0112 degC*degC

covar(u,temp)= 0.11 cm.degC/s
covar(v,temp)= 0.00 cm.degC/s

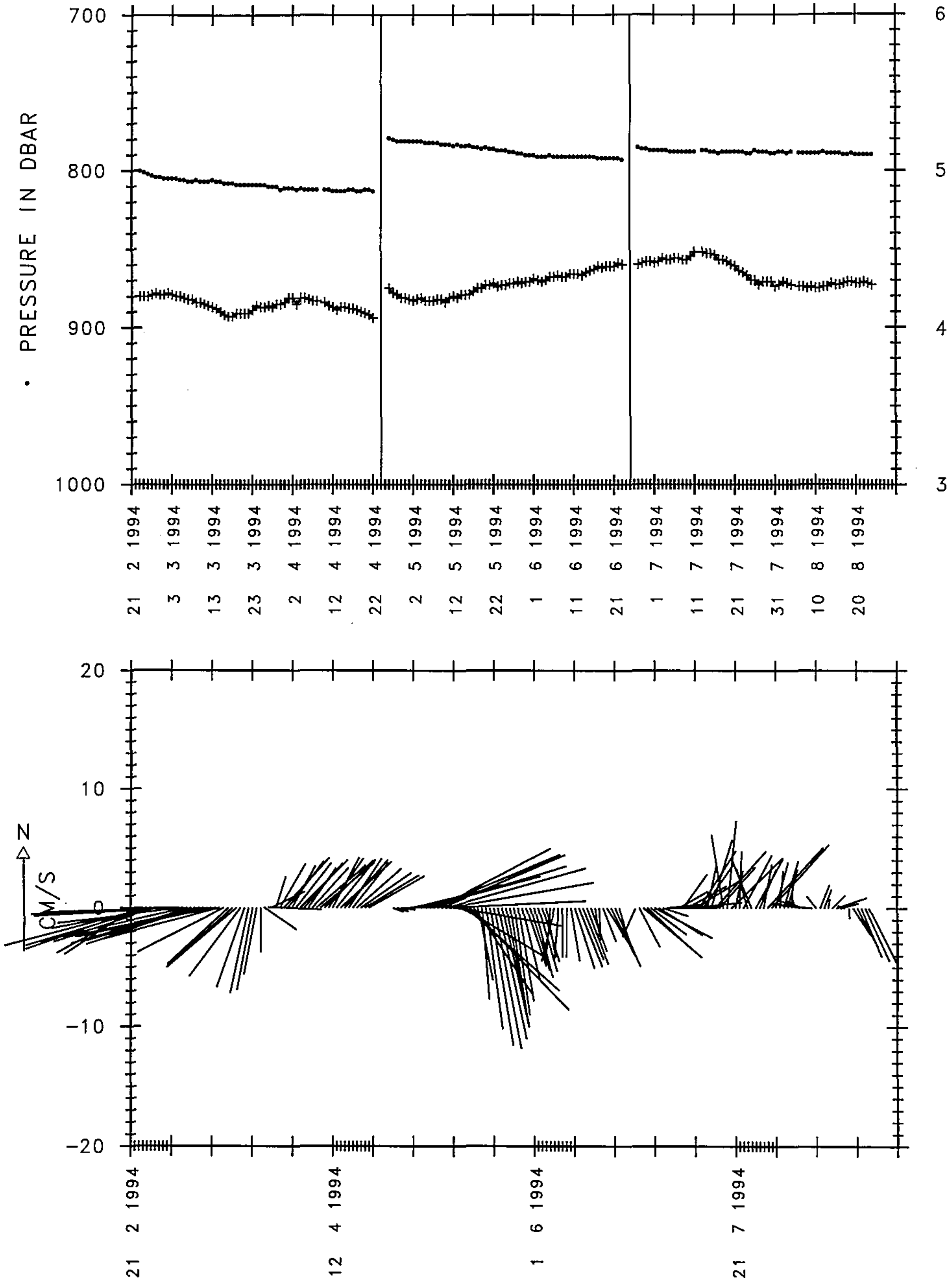
Comments:



SAMBA M115 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M115 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M115 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m115

launch date	launch lat	launch long
1994 2 21 7h UT	18.273 S	31.333 W

file	m115-c4.fin	m115-c5.fin	m115-c6.fin
date of 1st pos	1994 8 28 (16311)	1994 10 28 (16372)	1994 12 30 (16435)
1st pos	30.940W 19.750S	30.602W 19.917S	31.170W 20.219S
last pos	30.422W 19.649S	31.324W 19.954S	31.213W 19.310S
1st P and T	791dbar 4.27degC	786dbar 4.50degC	798dbar 4.37degC
last P and T	800dbar 4.30degC	795dbar 4.42degC	806dbar 4.25degC
displacements (East and North)	54km 11km	-75km -4km	-4km 101km
mean velocities (East and North)	1.10cm/s 0.23cm/s	-1.53cm/s -0.08cm/s	-0.09cm/s 2.05cm/s
number of pos	58	53	58

Velocity time series statistics:

sampling interval= 24 h
number of samples= 169

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.25 cm/s [-1.65, 1.15]
average north velocity comp.= 0.79 cm/s [-0.35, 1.93]

variances
variance of east velocity comp.= 7.48 cm2/s2 [2.45, 12.50]
variance of north velocity comp.= 4.97 cm2/s2 [1.63, 8.32]

covariance
covariance= -1.22 cm2/s2 [-4.12, 1.68]

Eddy Kinetic Energy
EKE= 6.22 cm2/s2 [3.21, 9.24]

Temperature time series statistics:

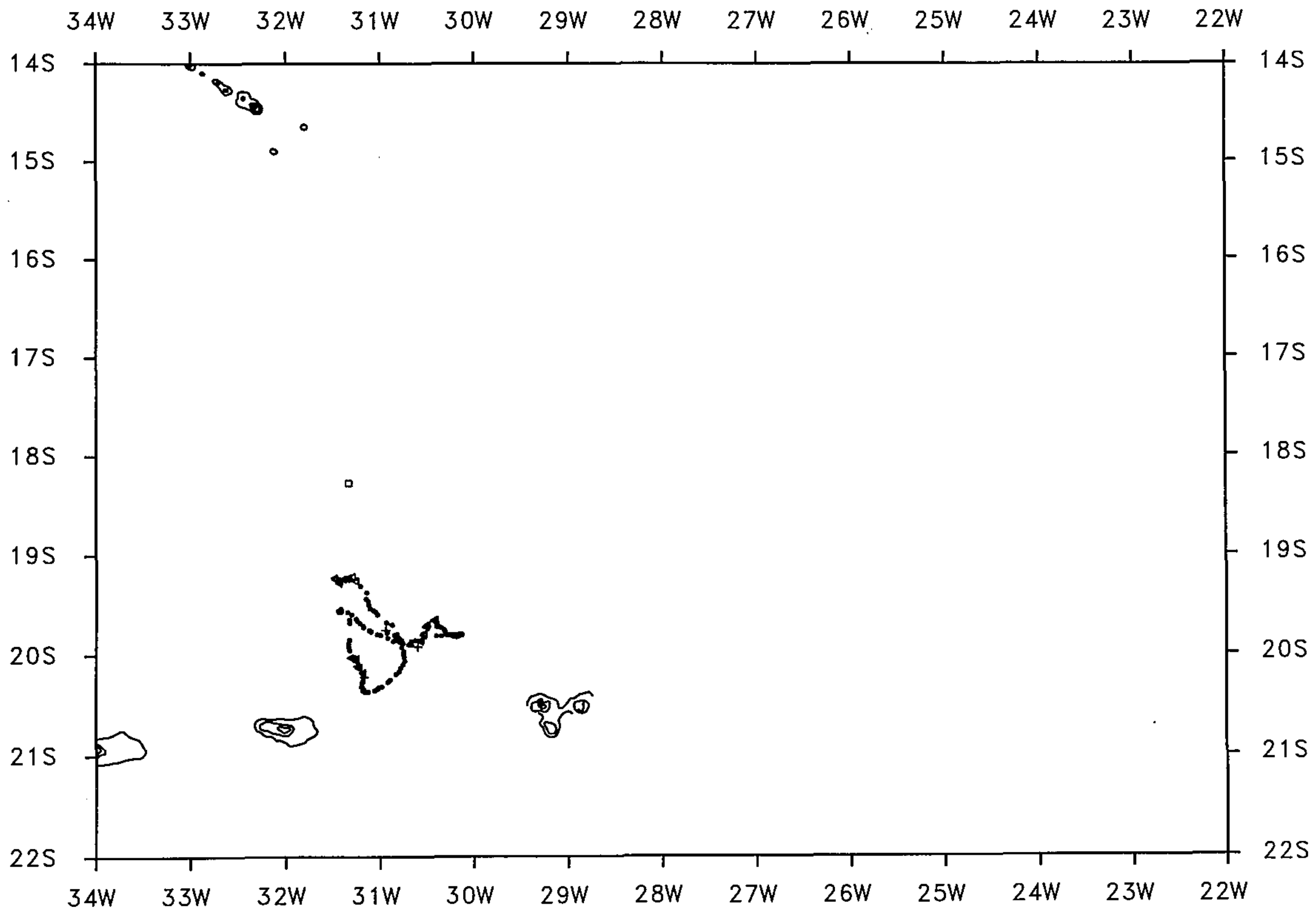
sampling interval= 24 h
number of samples= 158

average temperature= 4.34 degC

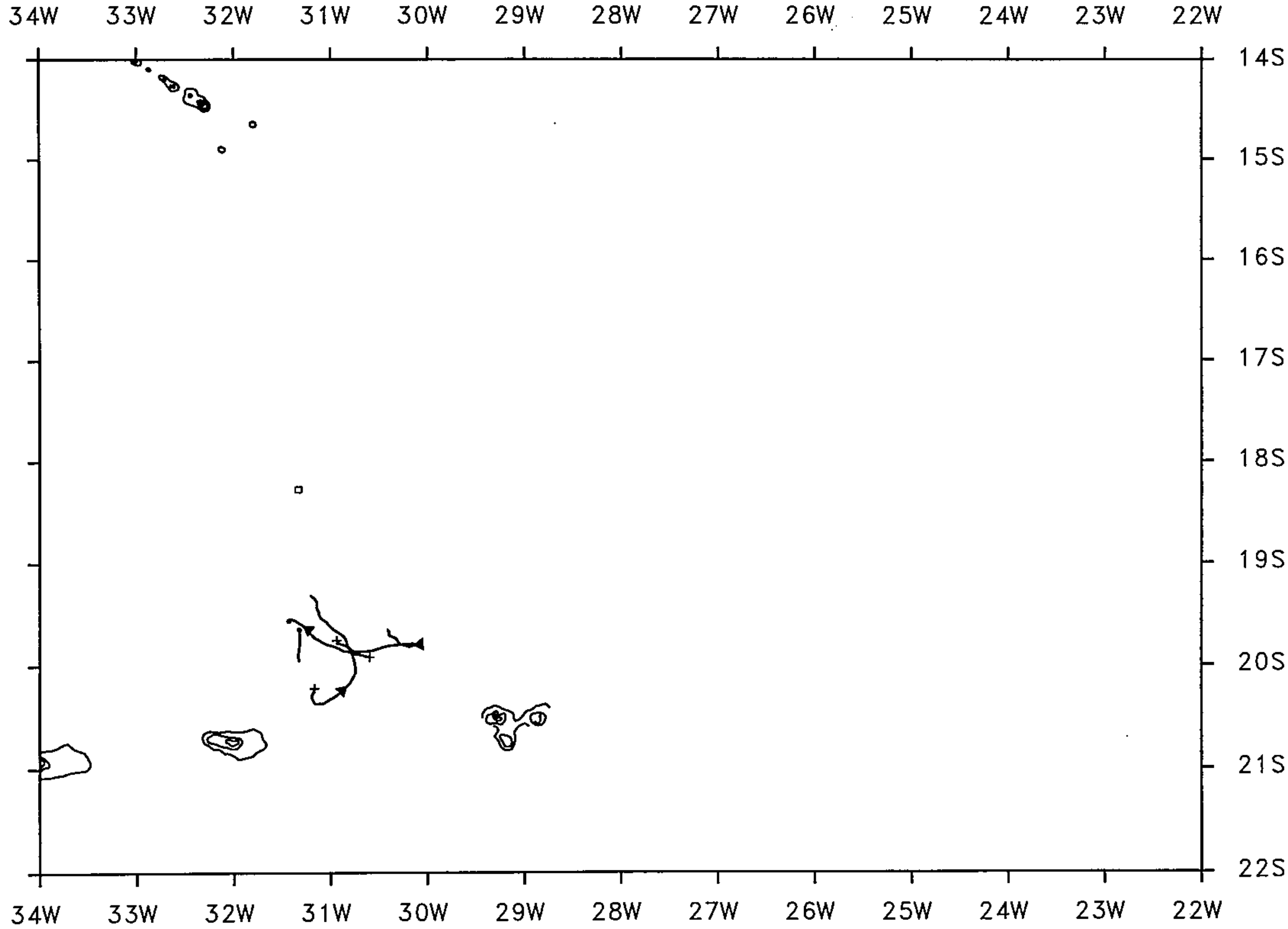
temperature variance= 0.0030 degC*degC

covar(u,temp)= -0.04 cm.degC/s
covar(v,temp)= -0.04 cm.degC/s

Comments:

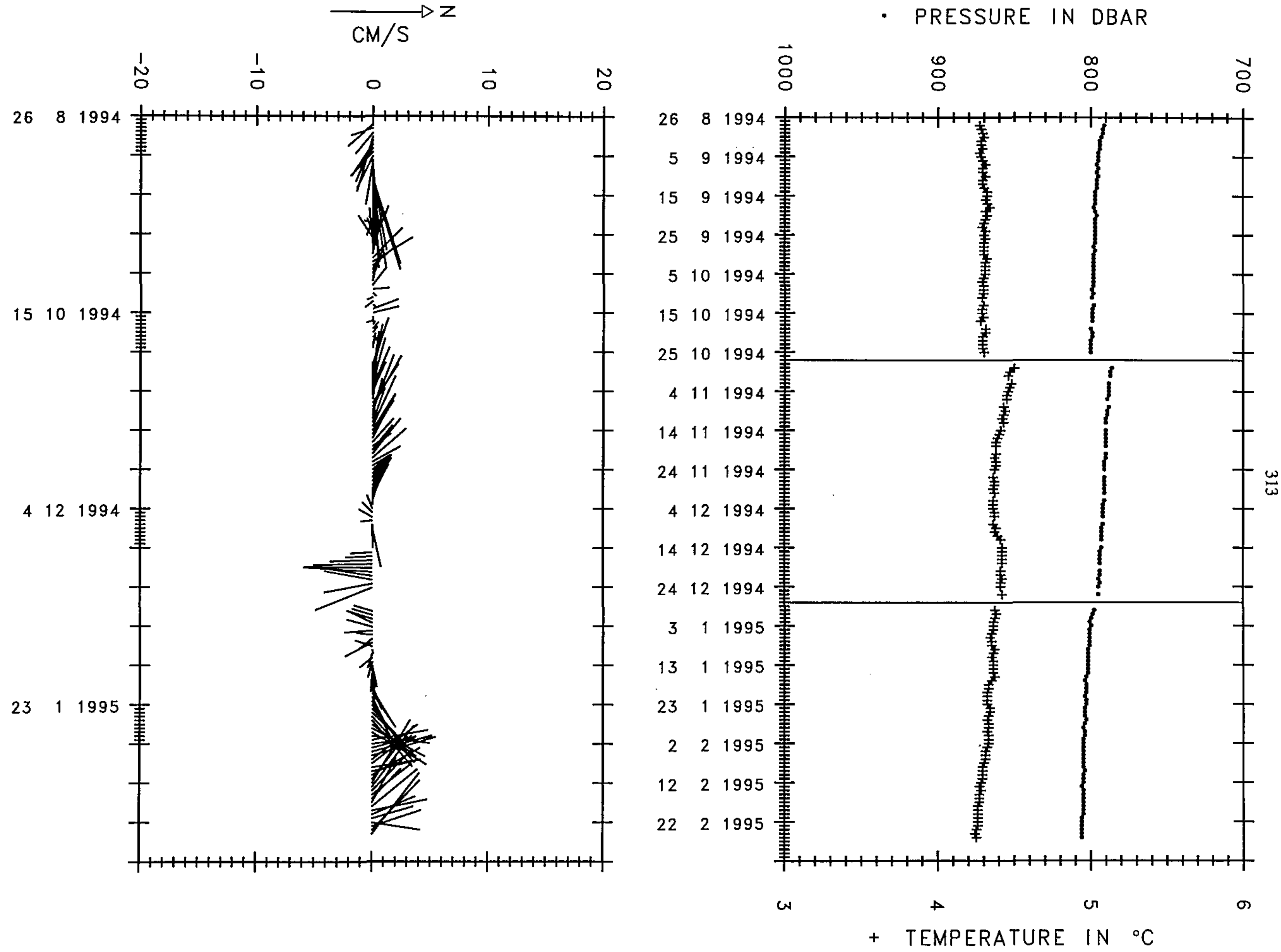


SAMBA M115 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M115 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED

SAMBA M115 CYCLES 4,5 AND 6



EXPERIMENT: SAMBA

FLOAT: m115

launch date	launch lat	launch long
1994 2 21 7h UT	18.273 S	31.333 W

file	m115-c7.fin	m115-c8.fin	m115-c9.fin
date of 1st pos	1995 3 1 (16496)	1995 5 2 (16558)	1995 7 3 (16620)
1st pos	31.564W 19.153S	31.575W 19.603S	31.696W 19.691S
last pos	31.475W 19.540S	31.539W 19.686S	31.952W 21.966S
1st P and T	793dbar 4.17degC	803dbar 4.21degC	782dbar 4.22degC
last P and T	831dbar 4.01degC	821dbar 3.97degC	823dbar 4.51degC
displacements (East and North)	9km -43km	4km -9km	-27km -253km
mean velocities (East and North)	0.18cm/s -0.84cm/s	0.07cm/s -0.18cm/s	-0.52cm/s -4.96cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.11 cm/s [-1.91, 1.68]
average north velocity comp.= -1.94 cm/s [-4.30, 0.41]

variances
variance of east velocity comp.= 13.10 cm2/s2 [4.54, 21.65]
variance of north velocity comp.= 22.62 cm2/s2 [7.84, 37.40]

covariance
covariance= 8.76 cm2/s2 [0.81, 16.72]

Eddy Kinetic Energy
EKE= 17.86 cm2/s2 [9.32, 26.40]

Temperature time series statistics:

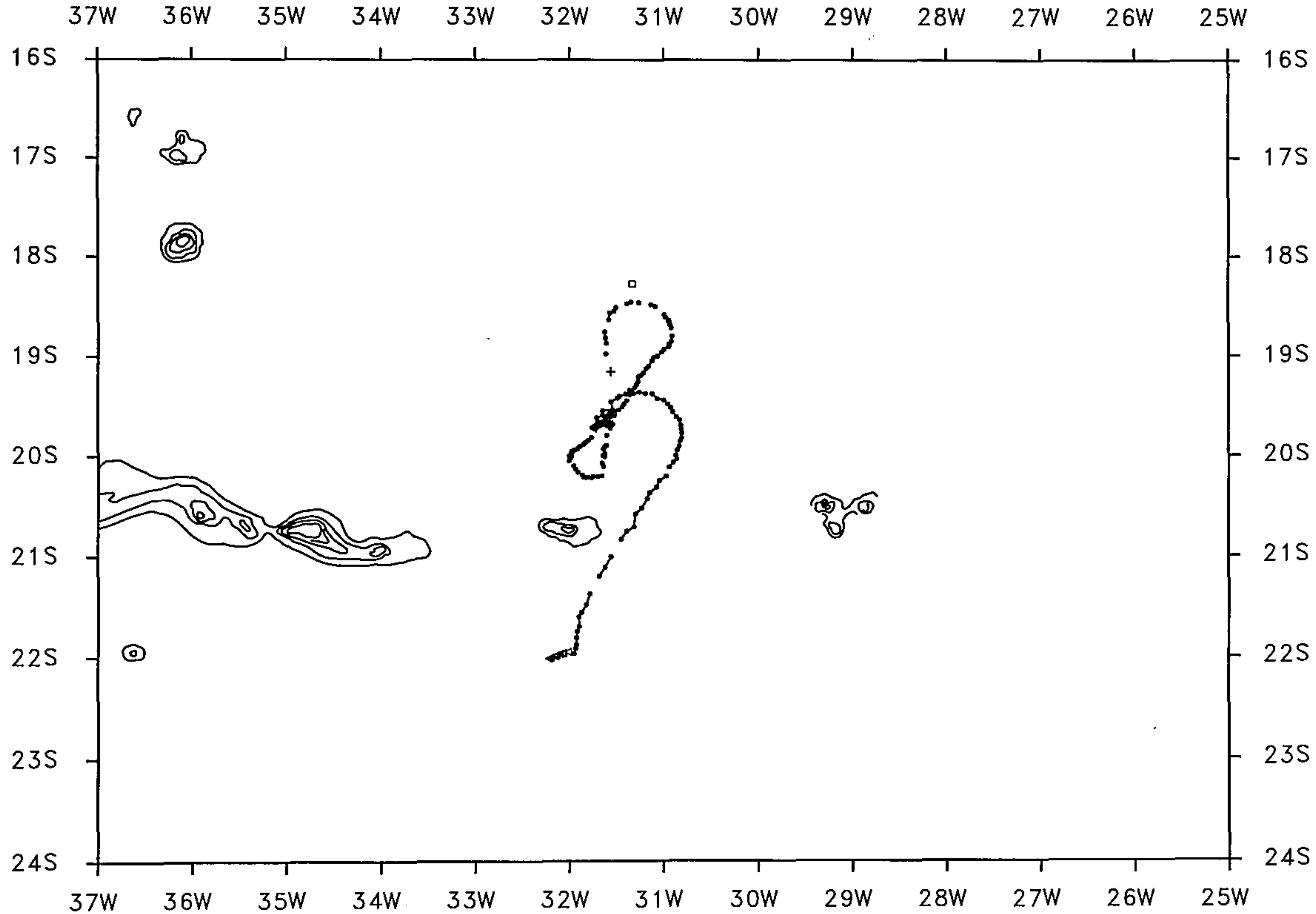
sampling interval= 24 h
number of samples= 177

average temperature= 4.11 degC

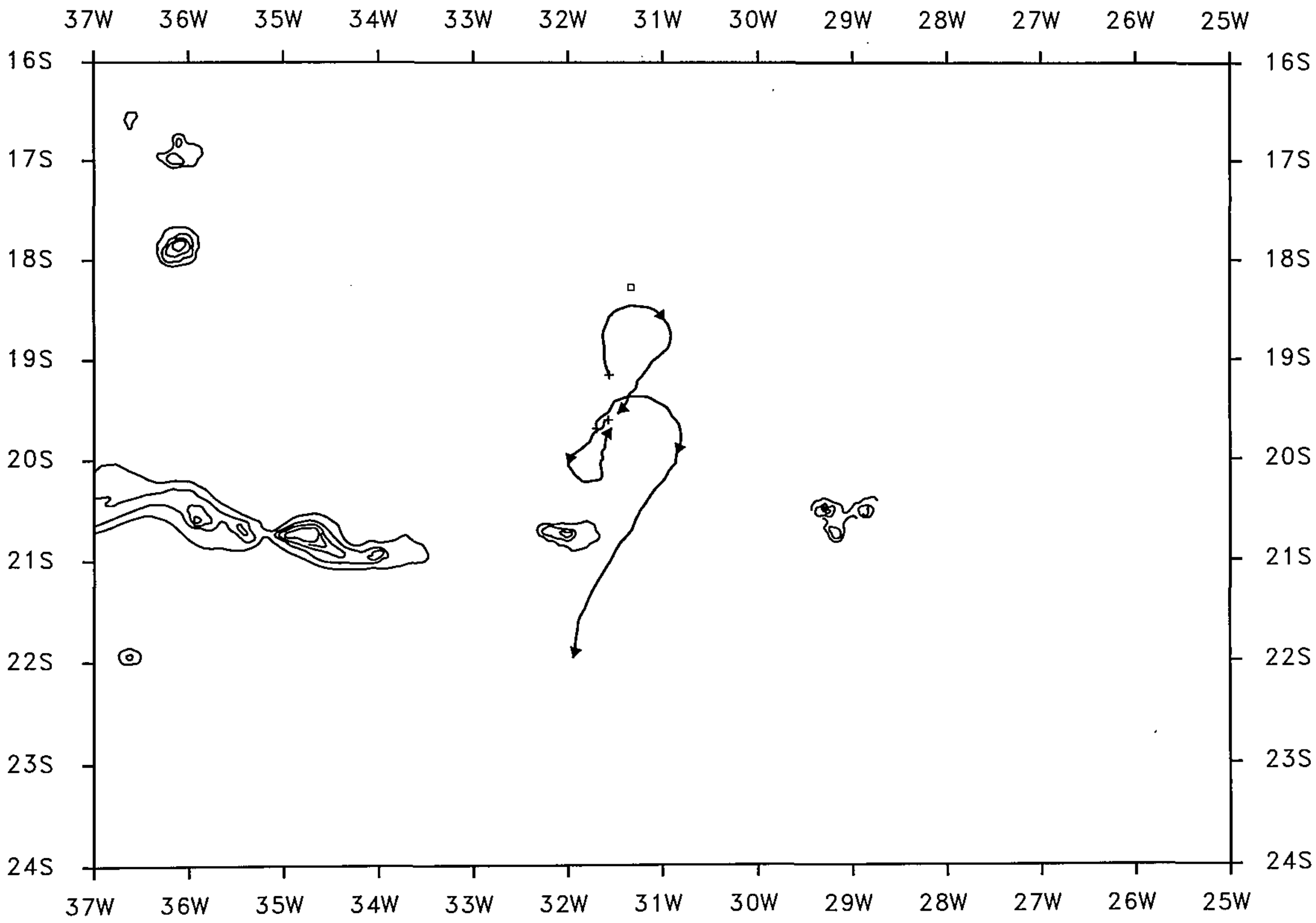
temperature variance= 0.0153 degC*degC

covar(u,temp)= -0.05 cm.degC/s
covar(v,temp)= -0.21 cm.degC/s

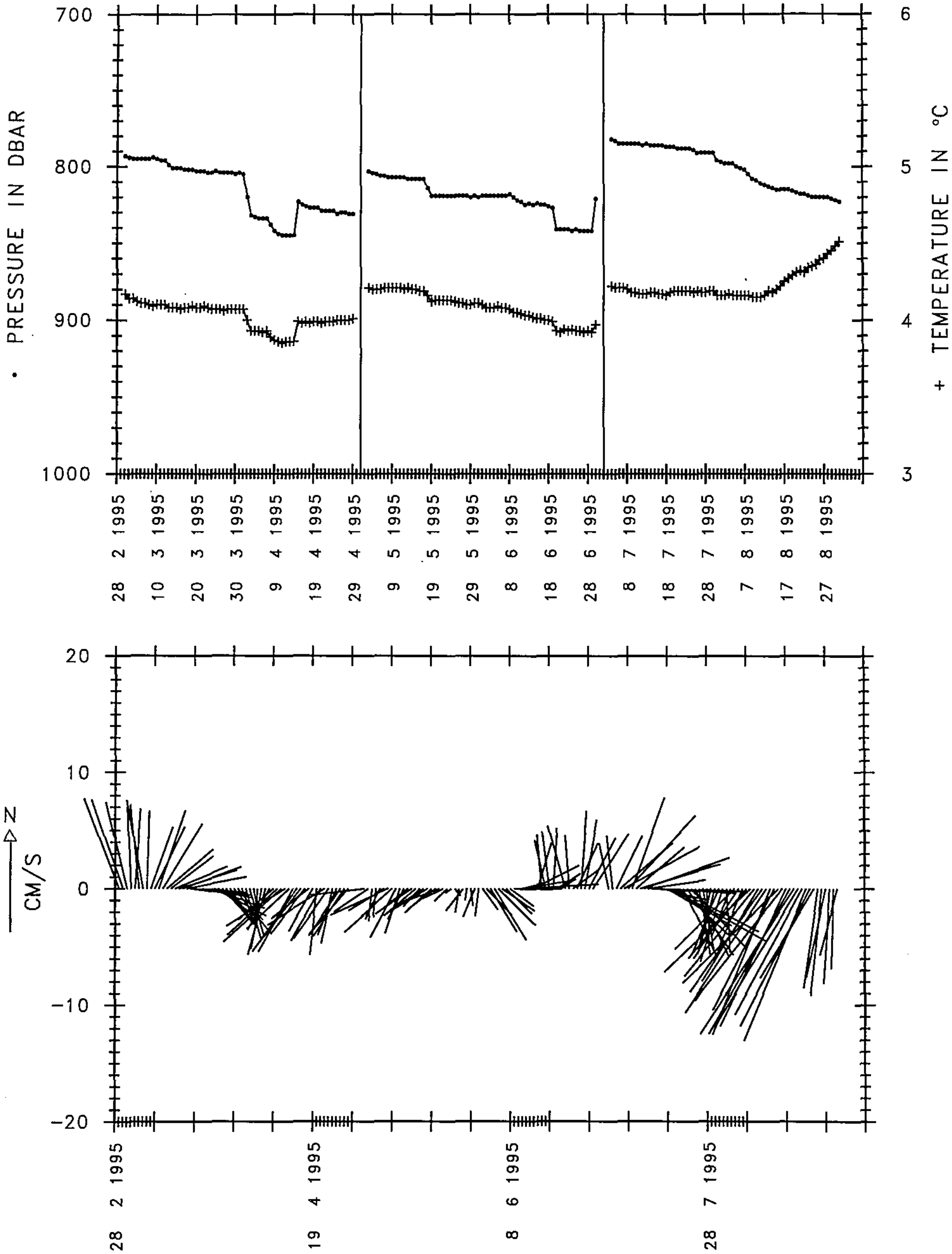
Comments:



SAMBA M115 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M115 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M115 CYCLES 7,8 AND 9

EXPERIMENT: **SAMBA**
FLOAT: **MARVOR #116**

LAUNCHED AT: 14°28.0'S 30°59.6'W on 22/02/1994 05h24 UT

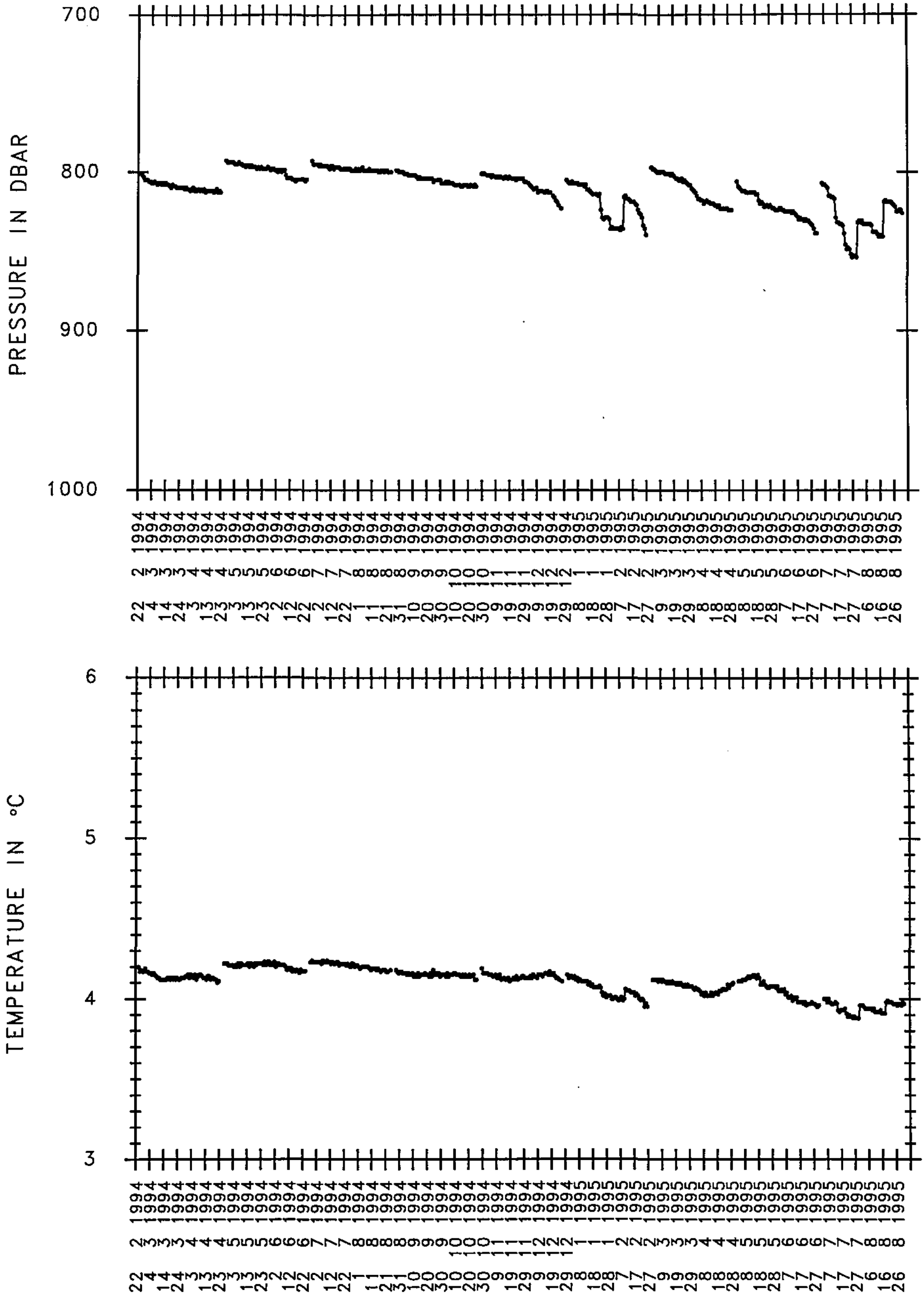
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

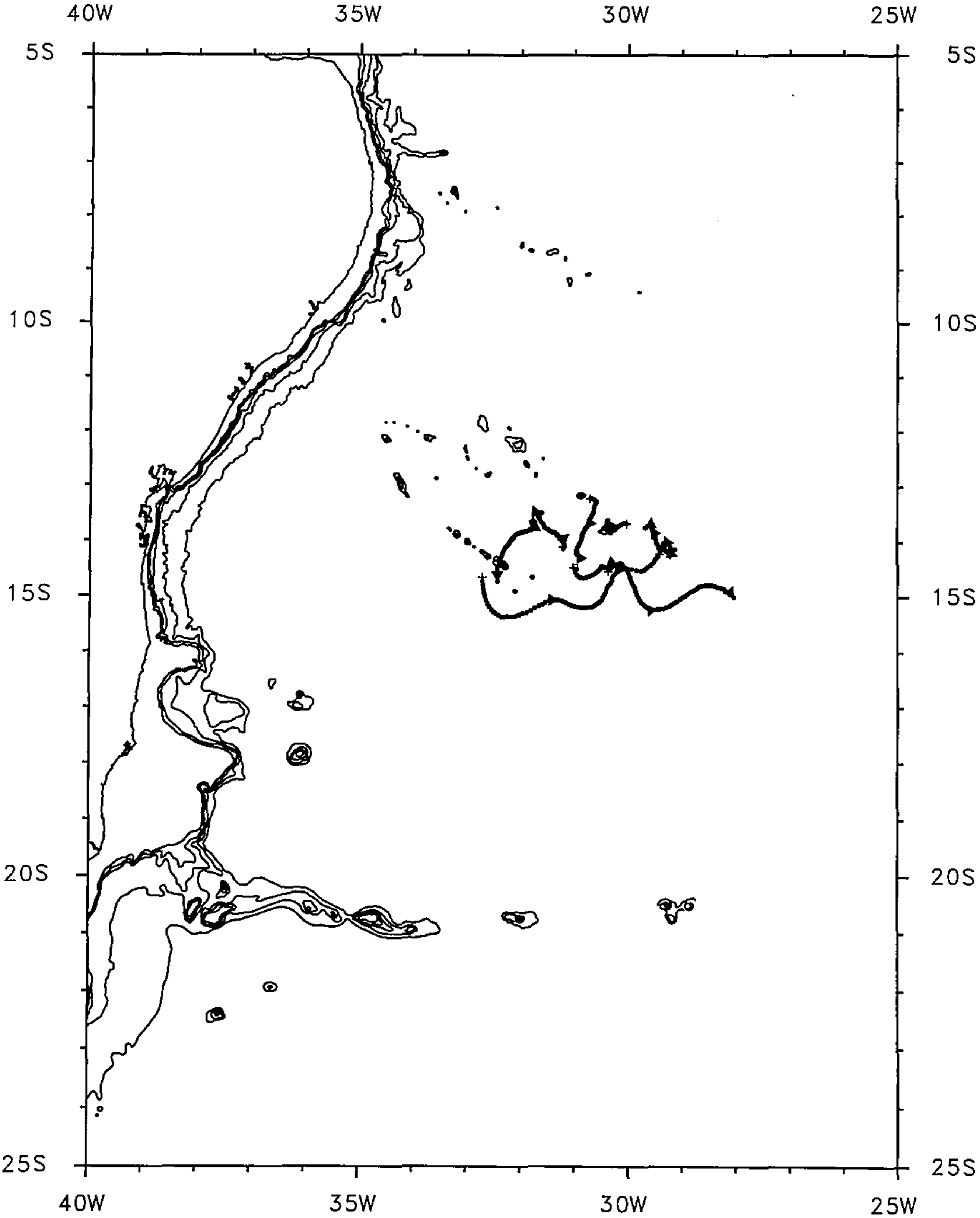
This float showed a mainly zonal mesoscale turbulent dispersion.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m116-c1.raw	m116-c1.fin	m116-c1.diaric
m116-c2.raw	m116-c2.fin	m116-c2.diaric
m116-c3.raw	m116-c3.fin	m116-c3.diaric
m116-c4.raw	m116-c4.fin	m116-c4.diaric
m116-c5.raw	m116-c5.fin	m116-c5.diaric
m116-c6.raw	m116-c6.fin	m116-c6.diaric
m116-c7.raw	m116-c7.fin	m116-c7.diaric
m116-c8.raw	m116-c8.fin	m116-c8.diaric
m116-c9.raw	m116-c9.fin	m116-c9.diaric



SAMBA M116 CYCLES 1 TO 9



SAMBA M116 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m116

launch date	launch lat	launch long
1994 2 22 5h UT	14.467 S	30.993 W

file	m116-c1.fin	m116-c2.fin	m116-c3.fin
date of 1st pos	1994 2 24 (16126)	1994 4 27 (16188)	1994 6 28 (16250)
1st pos	31.025W 14.471S	29.407W 14.127S	29.420W 14.222S
last pos	29.137W 14.134S	29.220W 14.097S	29.696W 13.751S
1st P and T	801dbar 4.20degC	793dbar 4.22degC	793dbar 4.23degC
last P and T	813dbar 4.11degC	805dbar 4.17degC	800dbar 4.18degC
displacements (East and North)	203km 37km	20km 3km	-30km 52km
mean velocities (East and North)	4.06cm/s 0.75cm/s	0.40cm/s 0.07cm/s	-0.59cm/s 1.04cm/s
number of pos	54	59	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 172

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 1.20 cm/s [-0.05, 2.45]
average north velocity comp.= 0.62 cm/s [-0.37, 1.60]

variances
variance of east velocity comp.= 5.96 cm2/s2 [1.95, 9.97]
variance of north velocity comp.= 3.71 cm2/s2 [1.22, 6.20]

covariance
covariance= 0.41 cm2/s2 [-1.83, 2.64]

Eddy Kinetic Energy
EKE= 4.84 cm2/s2 [2.48, 7.20]

Temperature time series statistics:

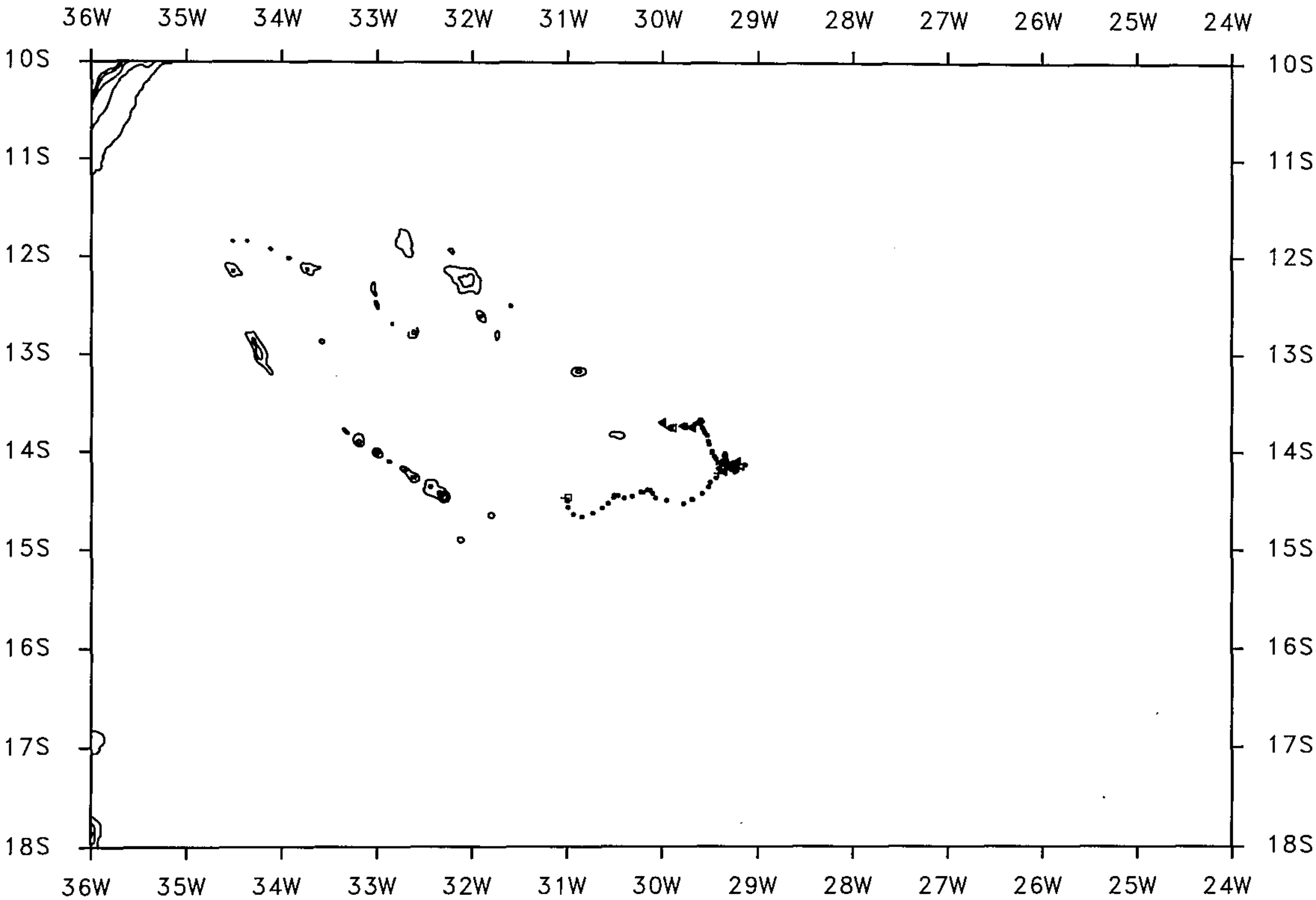
sampling interval= 24 h
number of samples= 171

average temperature= 4.19 degC

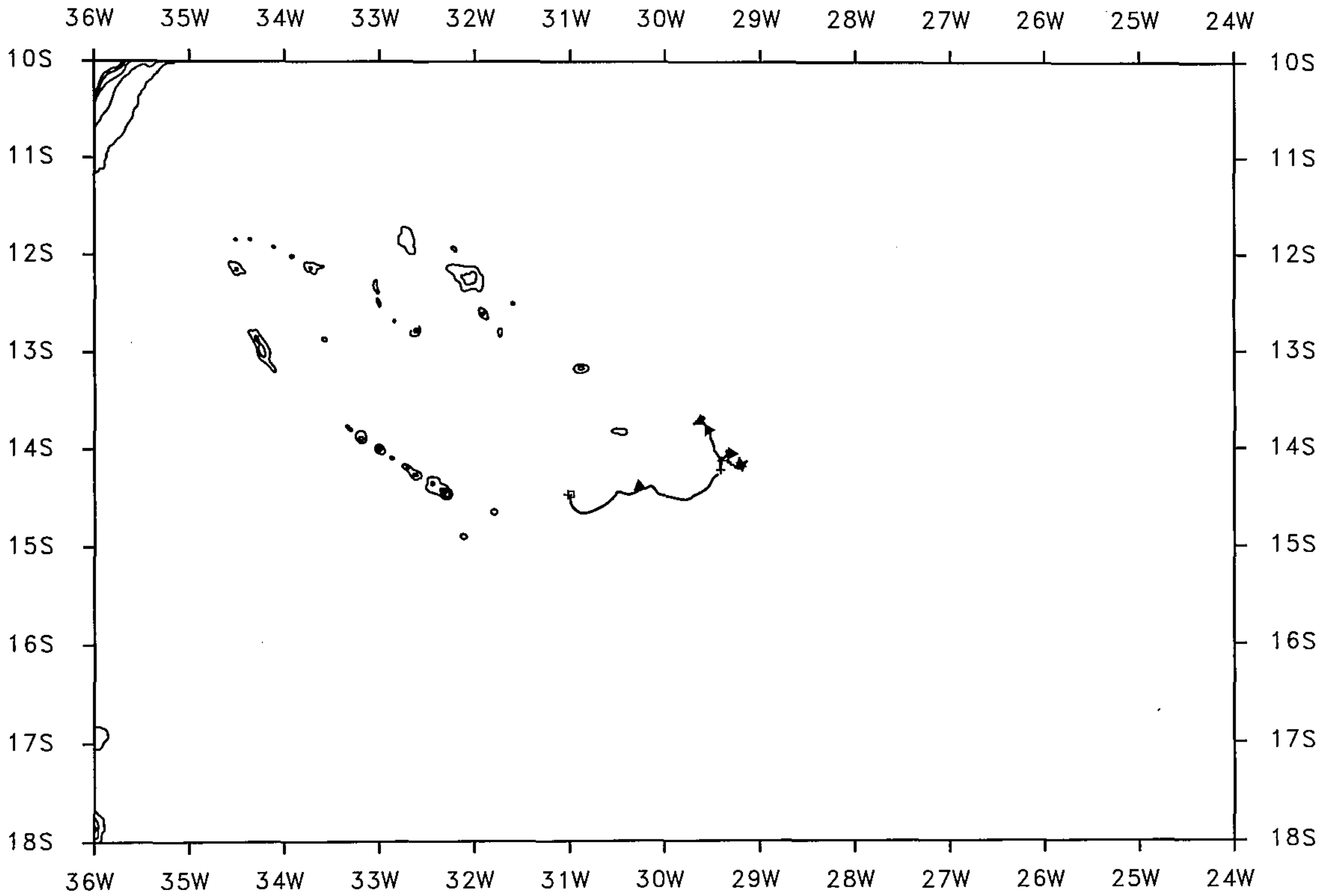
temperature variance= 0.0014 degC*degC

covar(u,temp)= -0.06 cm.degC/s
covar(v,temp)= -0.01 cm.degC/s

Comments:

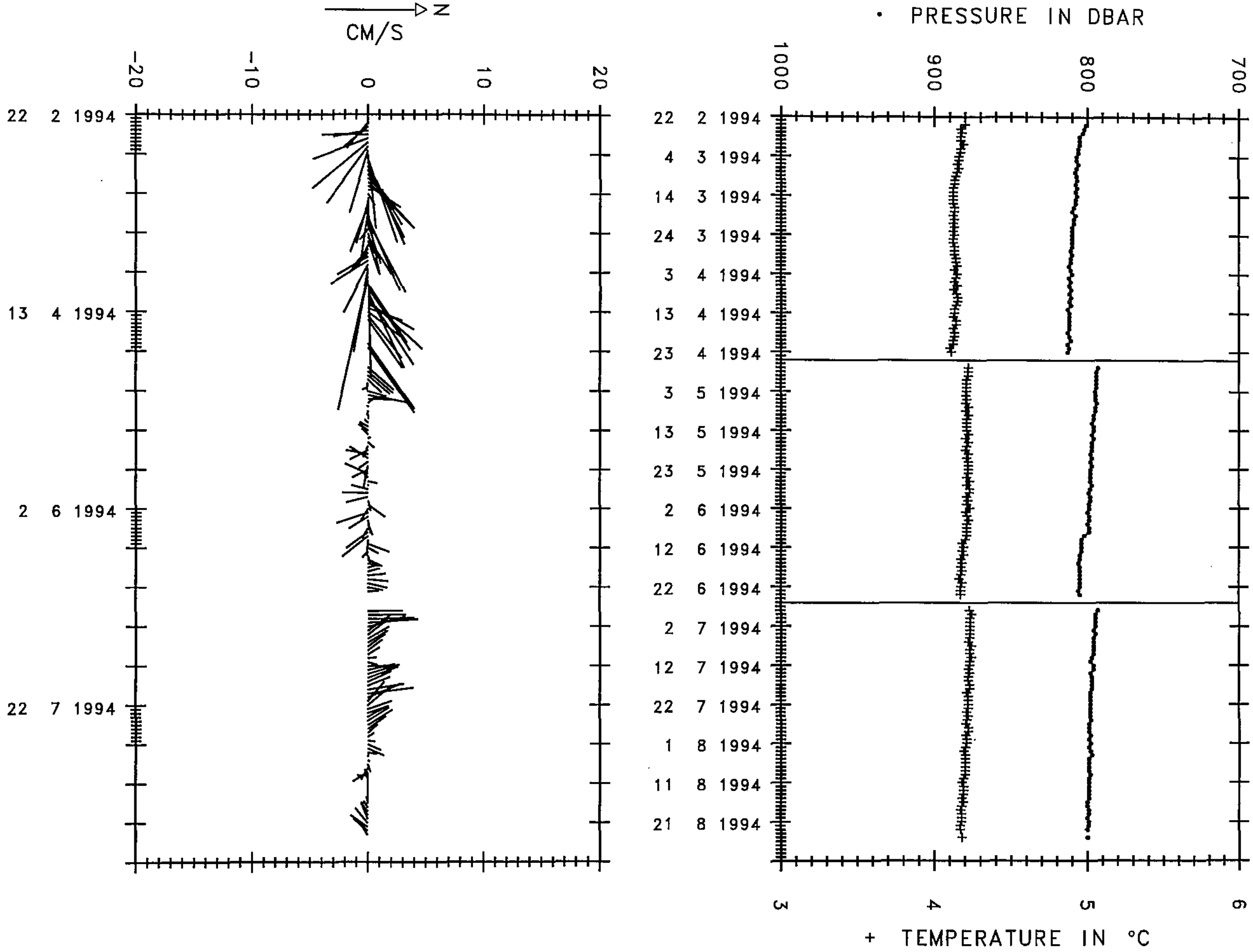


SAMBA M116 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M116 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED

SAMBA M116 CYCLES 1,2 AND 3



EXPERIMENT: SAMBA

FLOAT: m116

launch date	launch lat	launch long
1994 2 22 5h UT	14.467 S	30.993 W

file	m116-c4.fin	m116-c5.fin	m116-c6.fin
date of 1st pos	1994 8 29 (16312)	1994 10 30 (16374)	1994 12 31 (16436)
1st pos	30.035W 13.677S	30.719W 13.225S	31.217W 14.098S
last pos	30.390W 13.618S	30.955W 14.191S	31.618W 13.491S
1st P and T	799dbar 4.18degC	801dbar 4.19degC	805dbar 4.15degC
last P and T	809dbar 4.12degC	823dbar 4.11degC	840dbar 3.95degC
displacements (East and North)	-38km 7km	-25km -107km	-43km 67km
mean velocities (East and North)	-0.76cm/s 0.13cm/s	-0.51cm/s -2.14cm/s	-0.86cm/s 1.35cm/s
number of pos	59	59	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 177

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.68 cm/s [-1.37, 0.00]
average north velocity comp.= -0.22 cm/s [-1.22, 0.79]

variances
variance of east velocity comp.= 1.92 cm2/s2 [0.67, 3.18]
variance of north velocity comp.= 4.11 cm2/s2 [1.43, 6.80]

covariance
covariance= 0.39 cm2/s2 [-0.91, 1.69]

Eddy Kinetic Energy
EKE= 3.02 cm2/s2 [1.53, 4.50]

Temperature time series statistics:

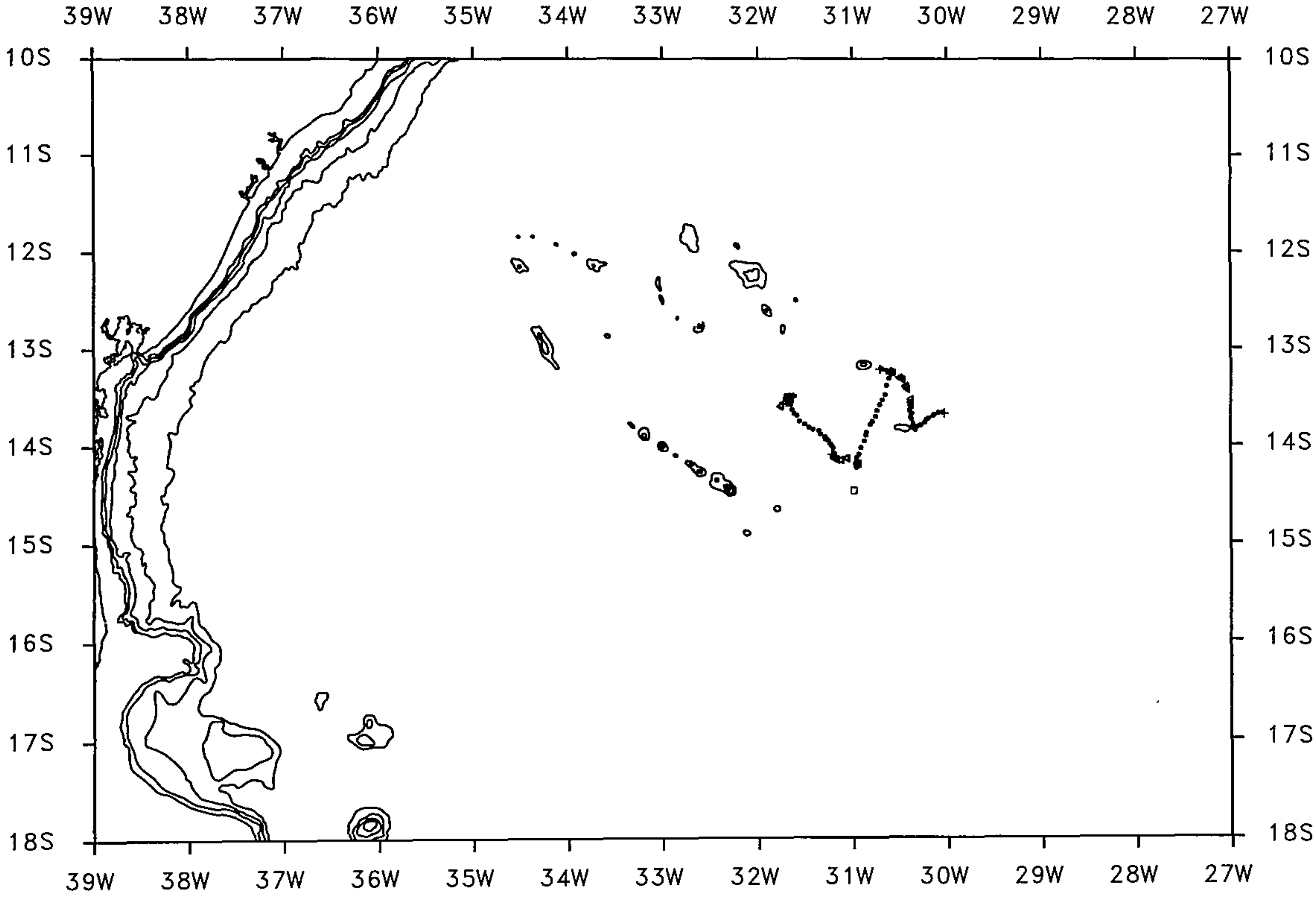
sampling interval= 24 h
number of samples= 166

average temperature= 4.11 degC

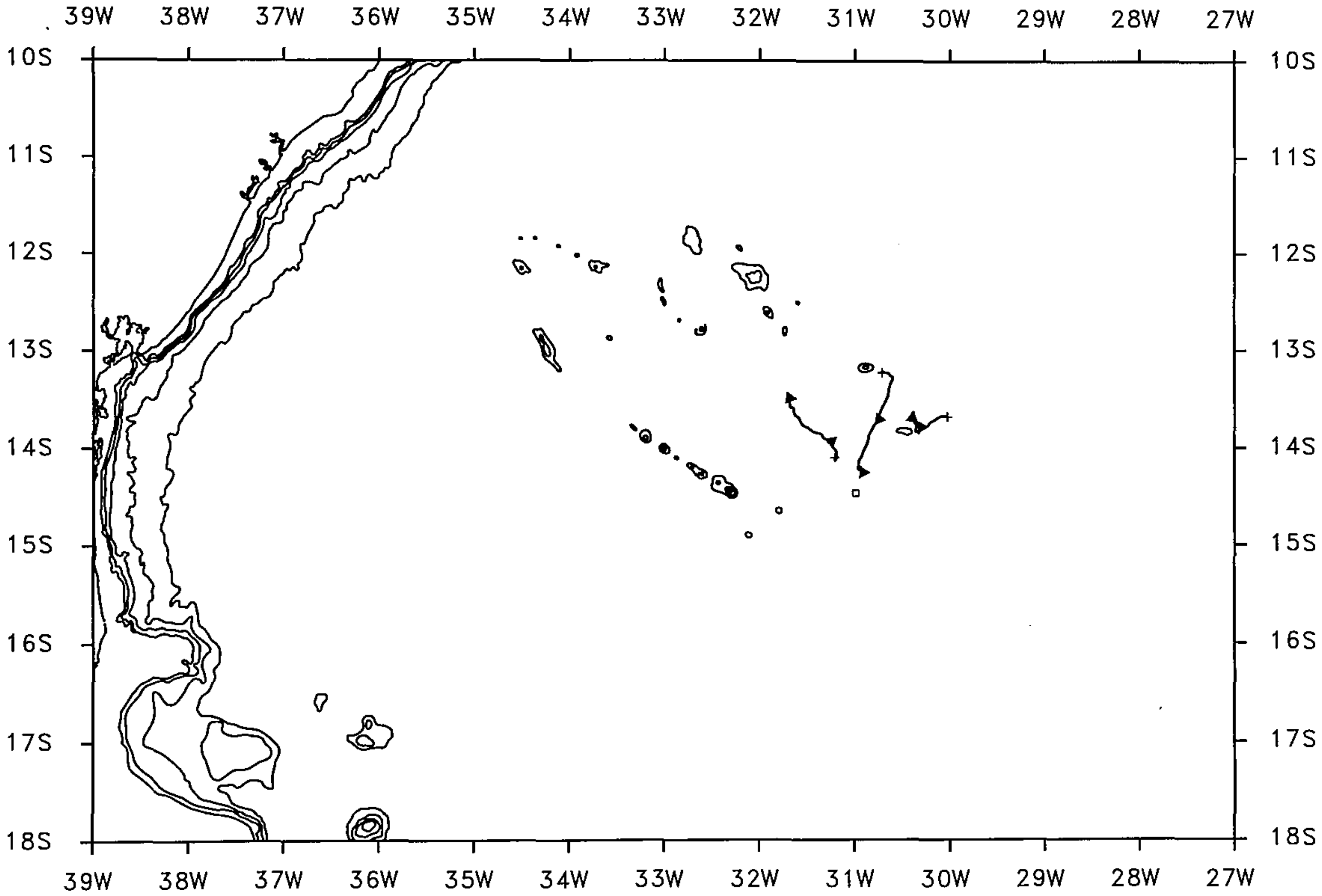
temperature variance= 0.0032 degC*degC

covar(u,temp)= 0.01 cm.degC/s
covar(v,temp)= -0.05 cm.degC/s

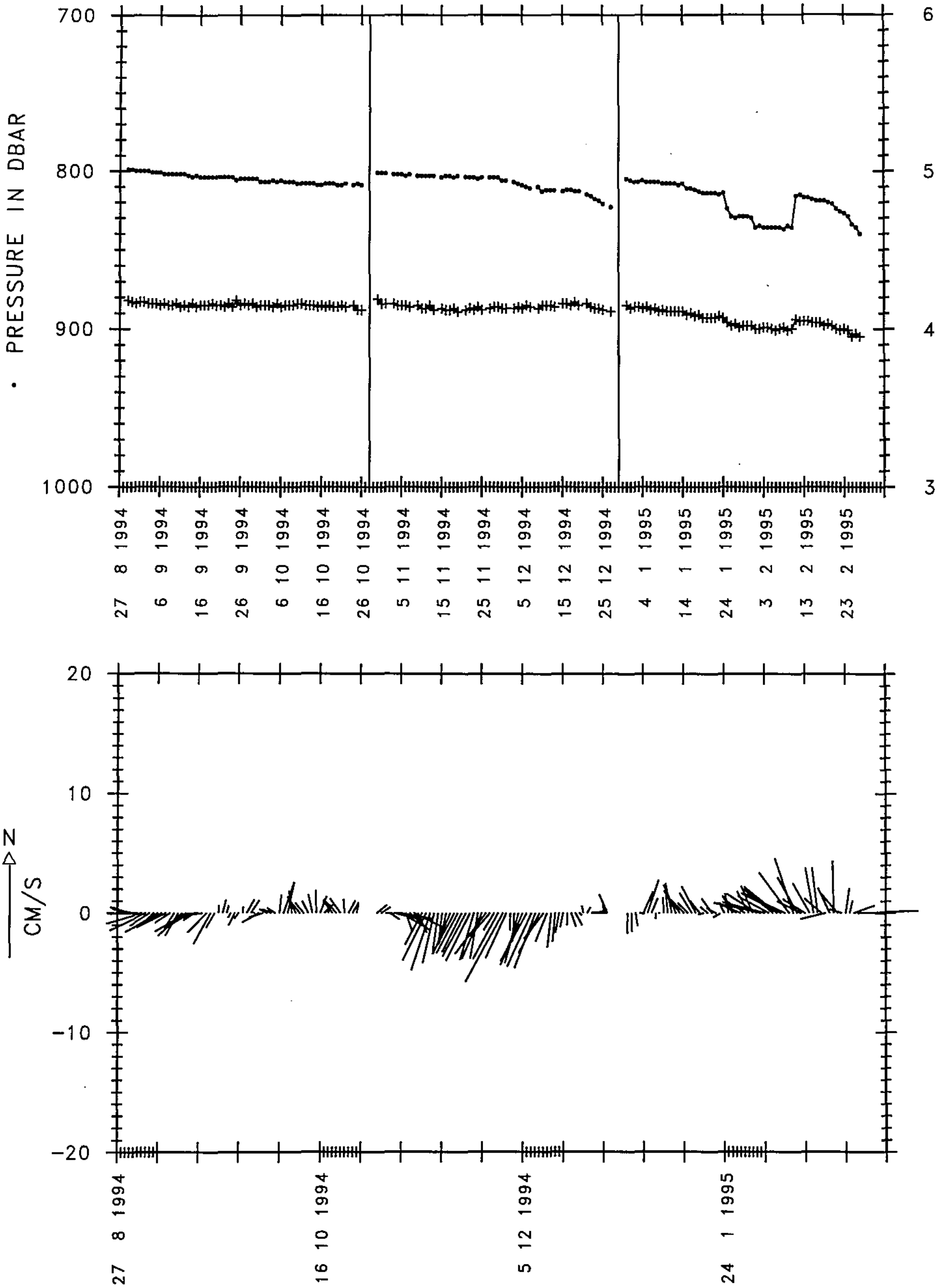
Comments:



SAMBA M116 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M116 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M116 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m116

launch date	launch lat	launch long
1994 2 22 5h UT	14.467 S	30.993 W

file	m116-c7.fin	m116-c8.fin	m116-c9.fin
date of 1st pos	1995 3 2 (16497)	1995 5 3 (16559)	1995 7 4 (16621)
1st pos	31.778W 13.642S	32.725W 14.652S	30.384W 14.534S
last pos	32.432W 14.731S	30.076W 14.486S	28.051W 15.004S
1st P and T	797dbar 4.12degC	806dbar 4.11degC	807dbar 4.00degC
last P and T	824dbar 4.10degC	839dbar 3.96degC	826dbar 3.97degC
displacements (East and North)	-70km -121km	285km 18km	251km -52km
mean velocities (East and North)	-1.38cm/s -2.37cm/s	5.59cm/s 0.36cm/s	4.92cm/s -1.02cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 3.02 cm/s [1.19, 4.84]
average north velocity comp.= -1.07 cm/s [-3.16, 1.02]

variances
variance of east velocity comp.= 13.58 cm2/s2 [4.71, 22.45]
variance of north velocity comp.= 17.79 cm2/s2 [6.17, 29.40]

covariance
covariance= 5.45 cm2/s2 [-1.73, 12.63]

Eddy Kinetic Energy
EKE= 15.68 cm2/s2 [8.37, 22.99]

Temperature time series statistics:

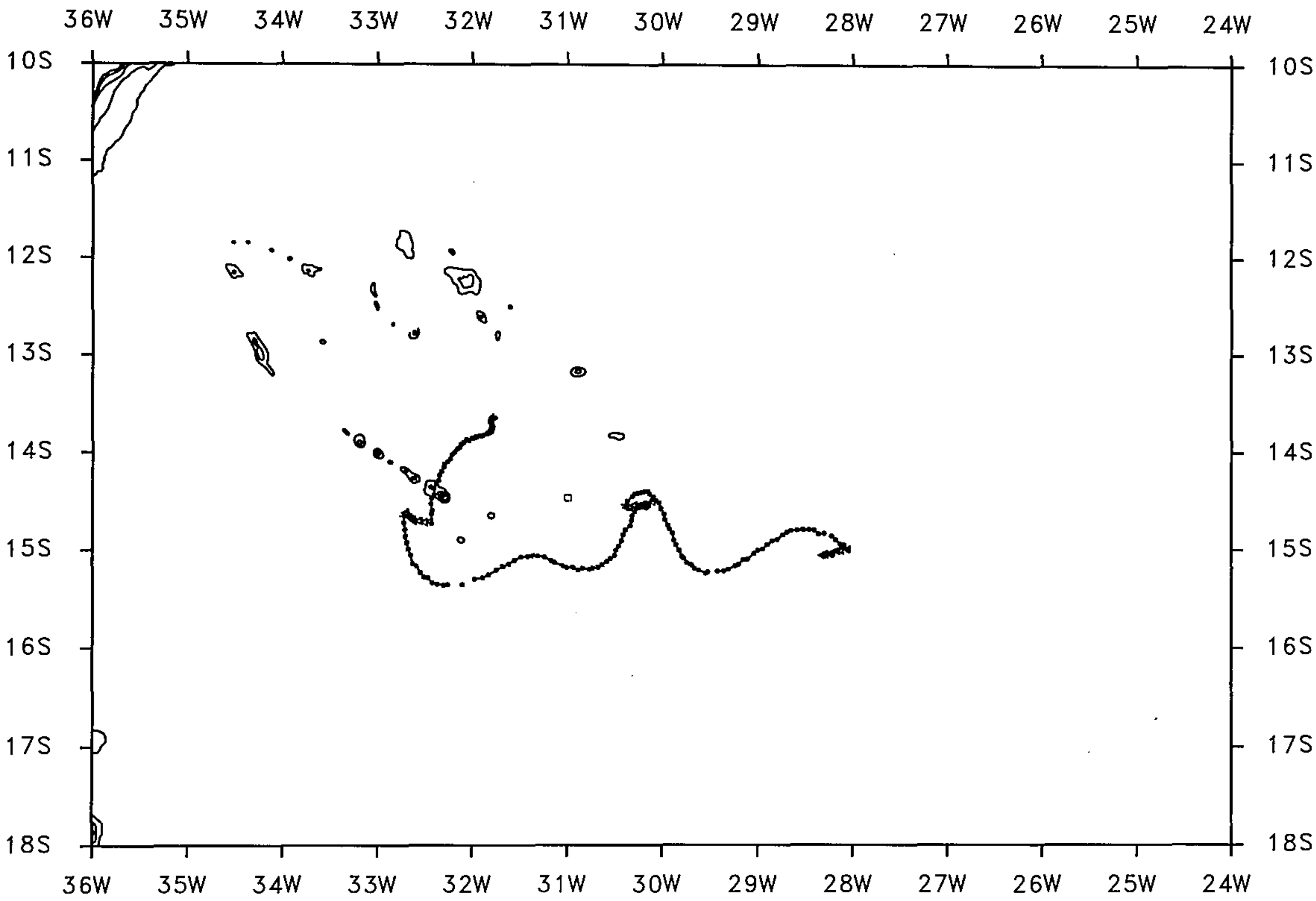
sampling interval= 24 h
number of samples= 177

average temperature= 4.02 degC

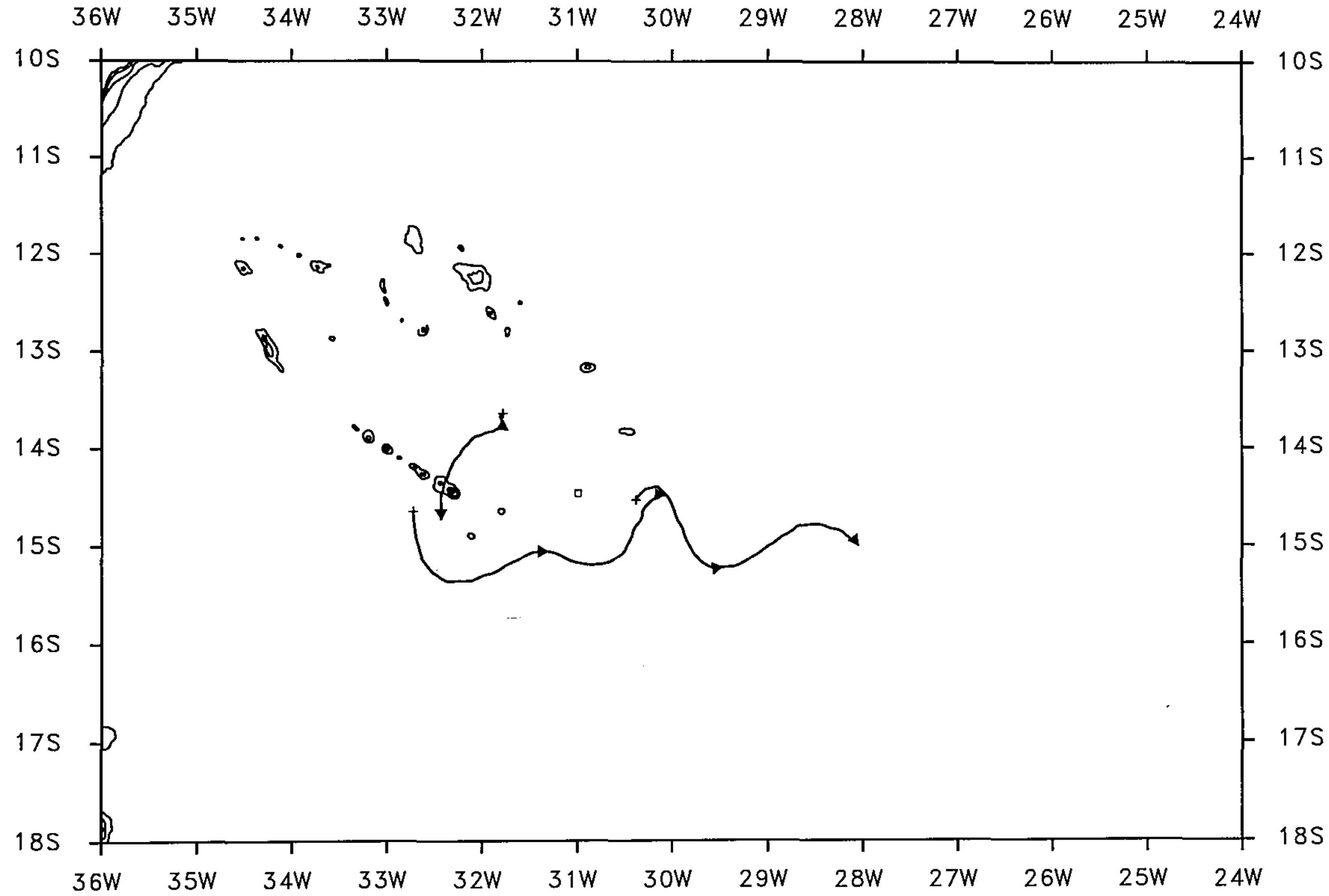
temperature variance= 0.0054 degC*degC

covar(u,temp)= -0.08 cm.degC/s
covar(v,temp)= -0.06 cm.degC/s

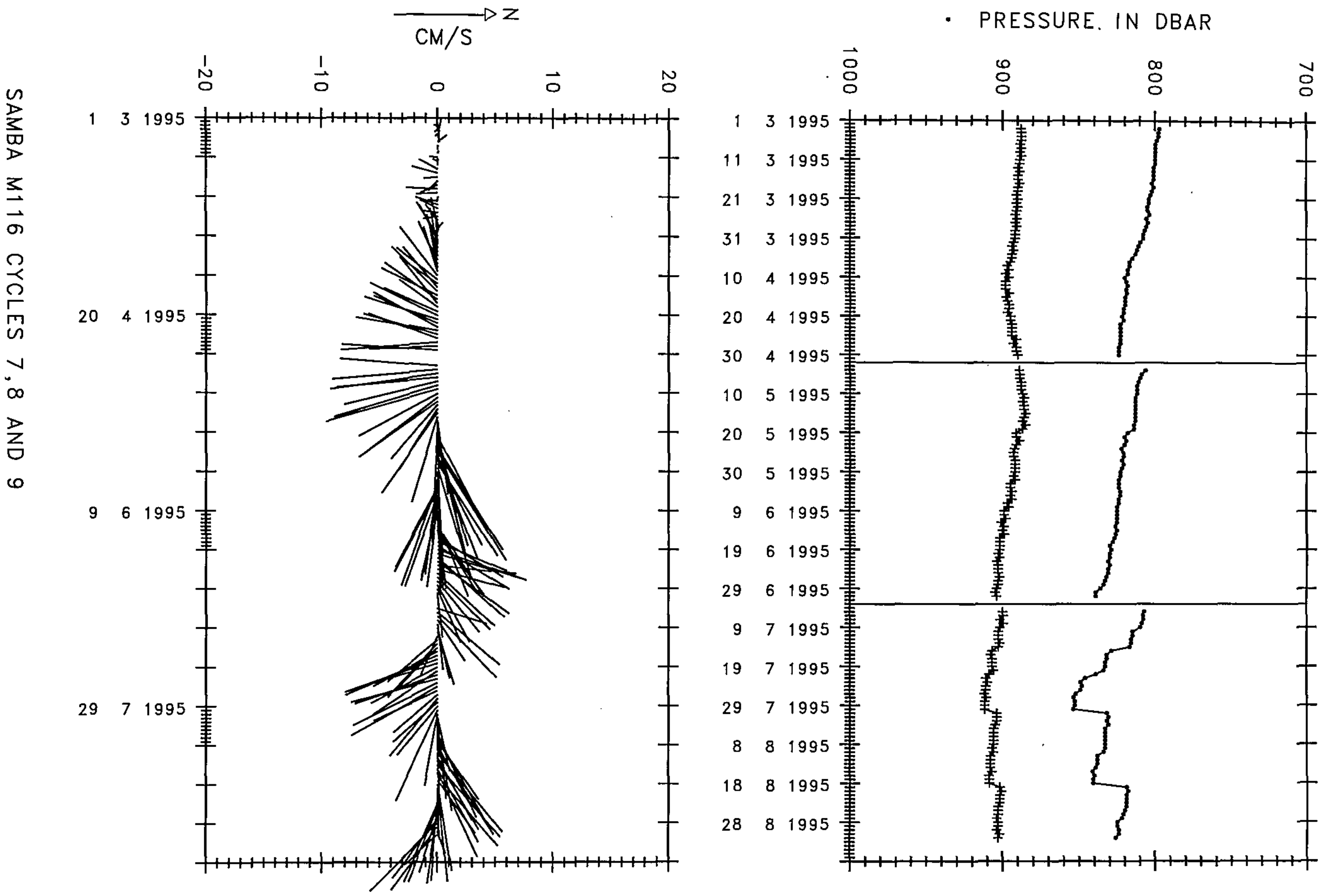
Comments:



SAMBA M116 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M116 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED


SAMBA M116 CYCLES 7,8 AND 9
CM/S
N
-20
-10
0
10
20
PRESSURE. IN DBAR
1000
900
800
700
1 3 1995
11 3 1995
21 3 1995
31 3 1995
10 4 1995
20 4 1995
30 4 1995
10 5 1995
20 5 1995
30 5 1995
9 6 1995
19 6 1995
29 6 1995
9 7 1995
19 7 1995
29 7 1995
8 8 1995
18 8 1995
28 8 1995
3
4
5
6
+ TEMPERATURE IN °C

EXPERIMENT: SAMBA
FLOAT: MARVOR #117

LAUNCHED AT: 14°15.0'S 30°46.1'W on 22/02/1994 07h26 UT

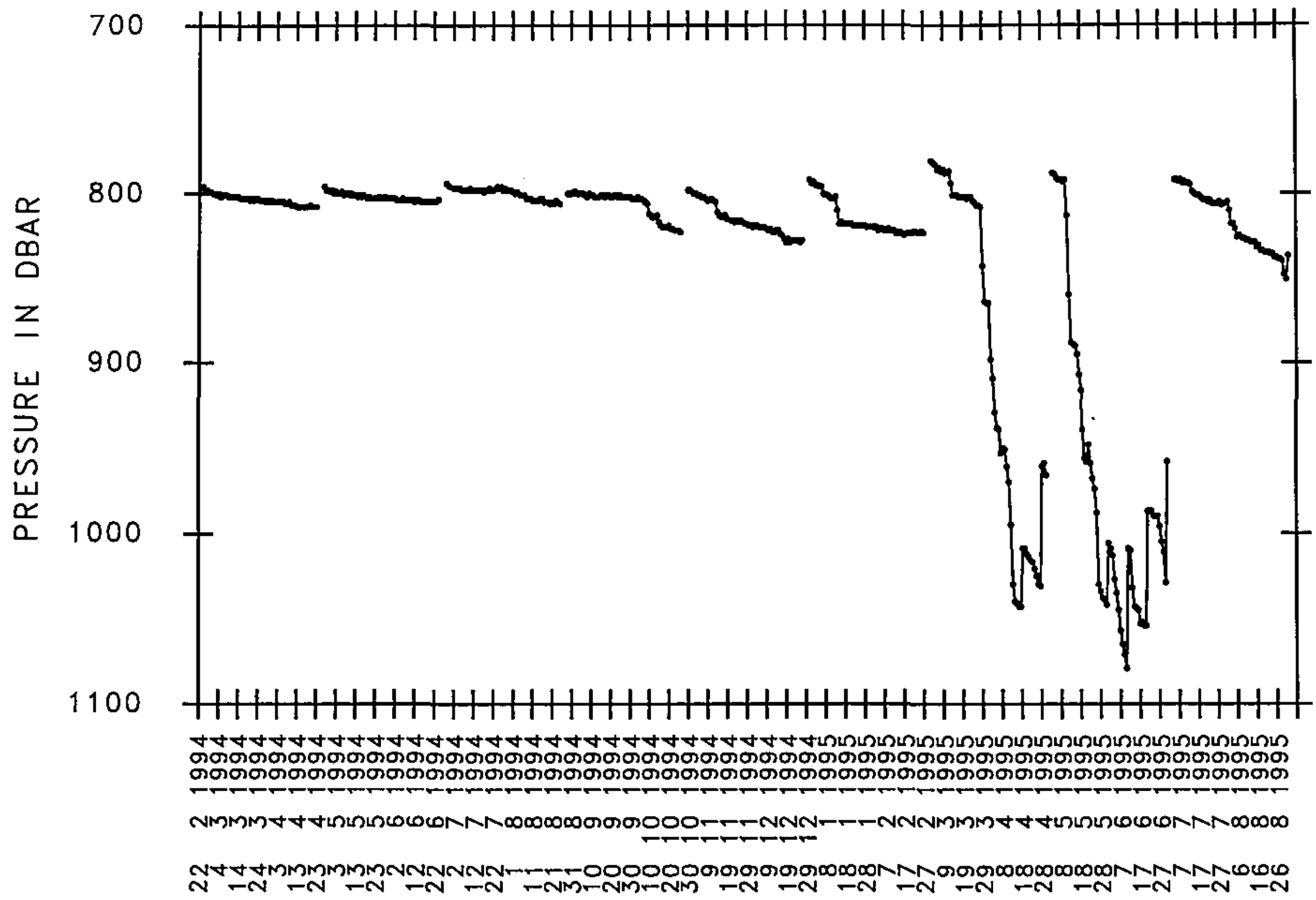
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

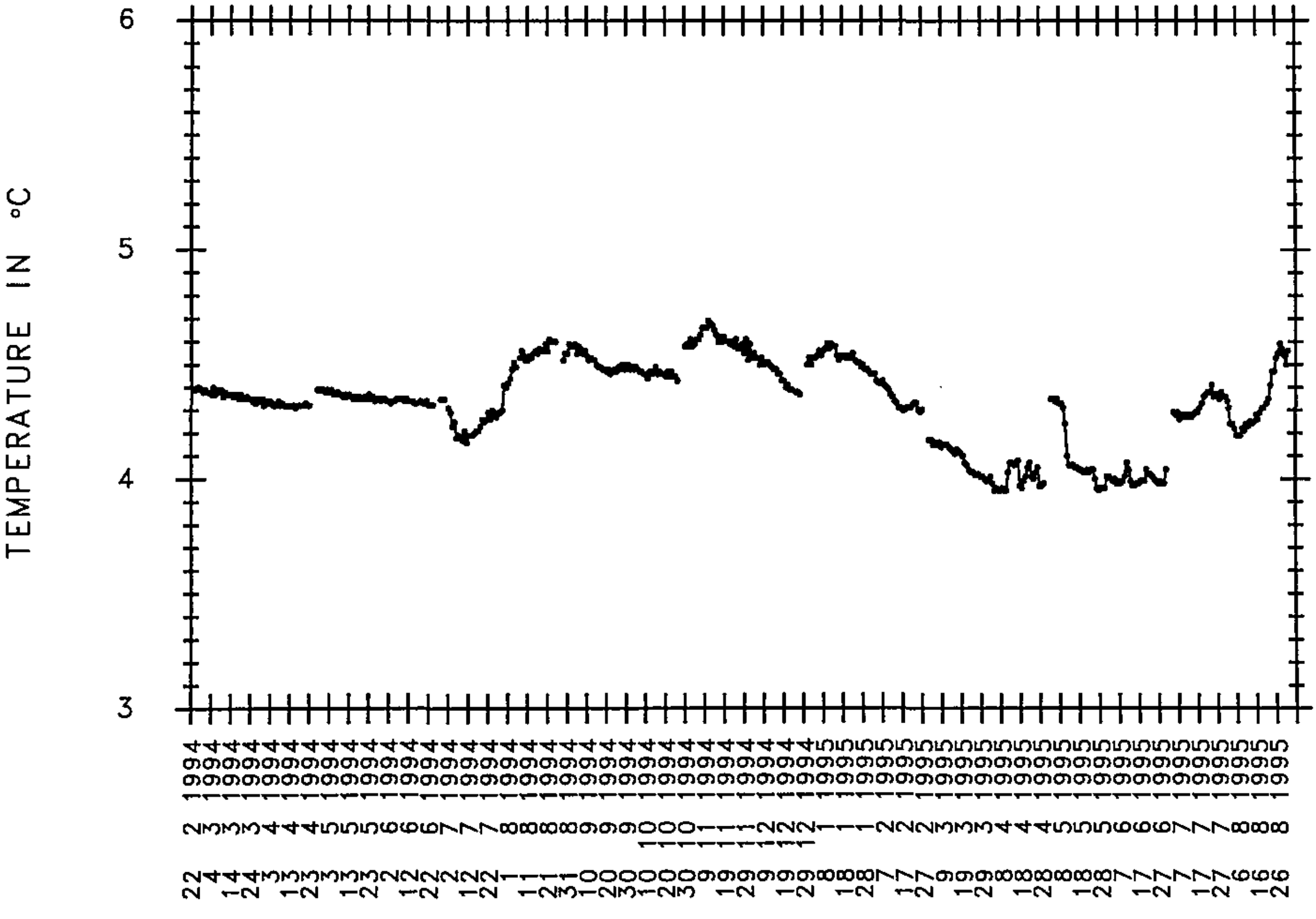
Comments

This float showed a mainly zonal dispersion with rather energetic motions.
Several abnormal behaviours (due to the hydraulics) are visible on the pressure time series, especially during cycles #7 and #8. As a consequence, the float was deeper than 900 dbar for 74 days.

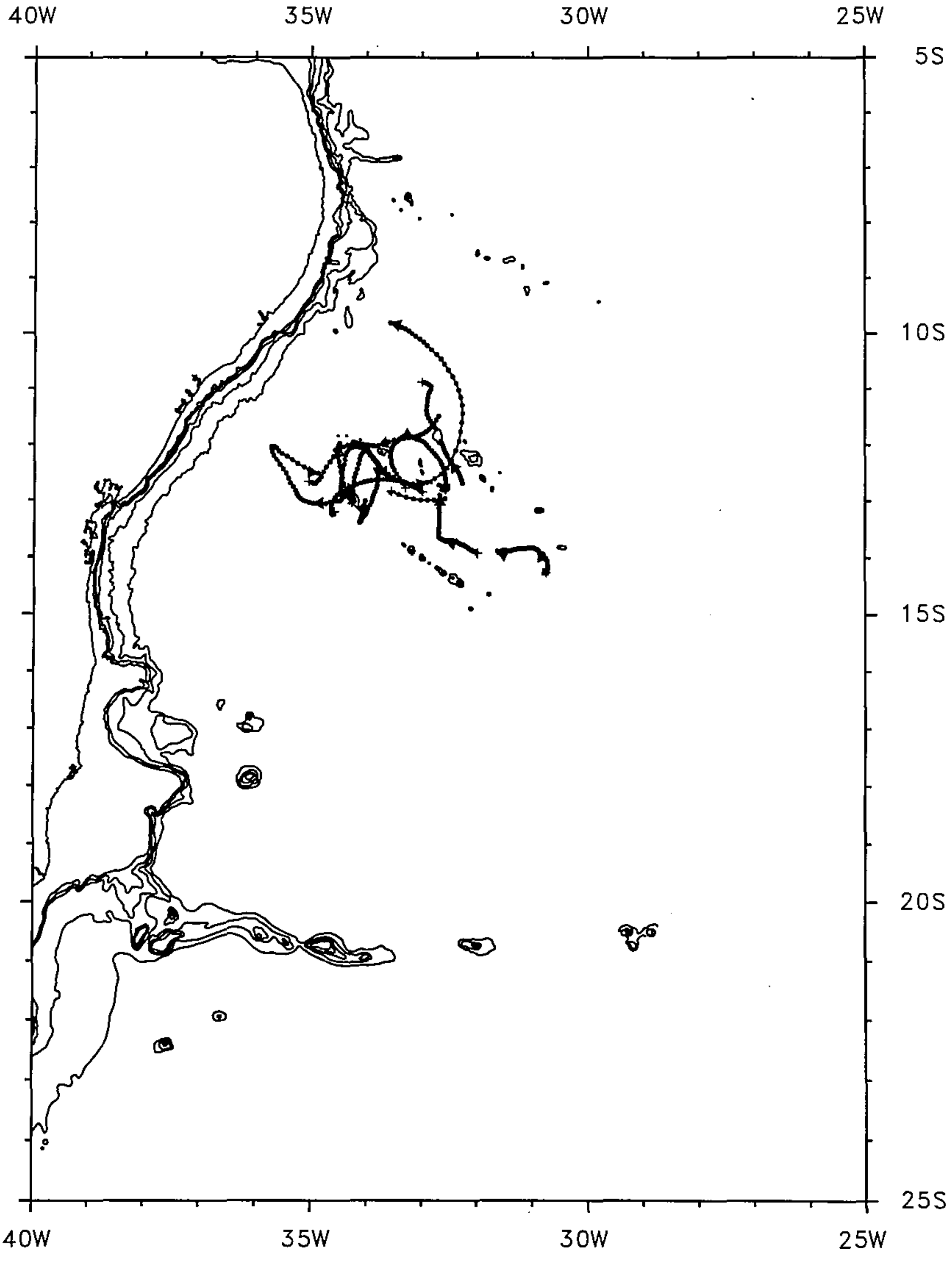
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m117-c1.raw	m117-c1.fin	m117-c1.diaric
m117-c2.raw	m117-c2.fin	m117-c2.diaric
m117-c3.raw	m117-c3.fin	m117-c3.diaric
m117-c4.raw	m117-c4.fin	m117-c4.diaric
m117-c5.raw	m117-c5.fin	m117-c5.diaric
m117-c6.raw	m117-c6.fin	m117-c6.diaric
m117-c7.raw	m117-c7.fin	m117-c7.diaric
m117-c8.raw	m117-c8.fin	m117-c8.diaric
m117-c9.raw	m117-c9.fin	m117-c9.diaric





SAMBA M117 CYCLES 1 TO 9



SAMBA M117 (FEBRUARY 1994 – AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m117

launch date	launch lat	launch long
1994 2 22 7h UT	14.250 S	30.768 W

file	m117-c1.fin	m117-c2.fin	m117-c3.fin
date of 1st pos	1994 2 24 (16126)	1994 4 27 (16188)	1994 6 28 (16250)
1st pos	30.757W 14.261S	31.992W 13.925S	33.309W 12.777S
last pos	31.634W 13.899S	32.686W 12.905S	32.702W 12.723S
1st P and T	796dbar 4.39degC	796dbar 4.39degC	794dbar 4.35degC
last P and T	808dbar 4.32degC	804dbar 4.32degC	806dbar 4.60degC
displacements (East and North)	-95km 40km	-75km 113km	66km 6km
mean velocities (East and North)	-1.89cm/s 0.80cm/s	-1.50cm/s 2.26cm/s	1.31cm/s 0.12cm/s
number of pos	59	59	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 177

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -0.73 cm/s [-2.11, 0.65]
average north velocity comp.= 1.11 cm/s [-0.59, 2.81]

variances
variance of east velocity comp.= 7.75 cm2/s2 [2.69, 12.81]
variance of north velocity comp.= 11.78 cm2/s2 [4.08, 19.48]

covariance
covariance= -3.88 cm2/s2 [-8.30, 0.53]

Eddy Kinetic Energy
EKE= 9.76 cm2/s2 [5.16, 14.37]

Temperature time series statistics:

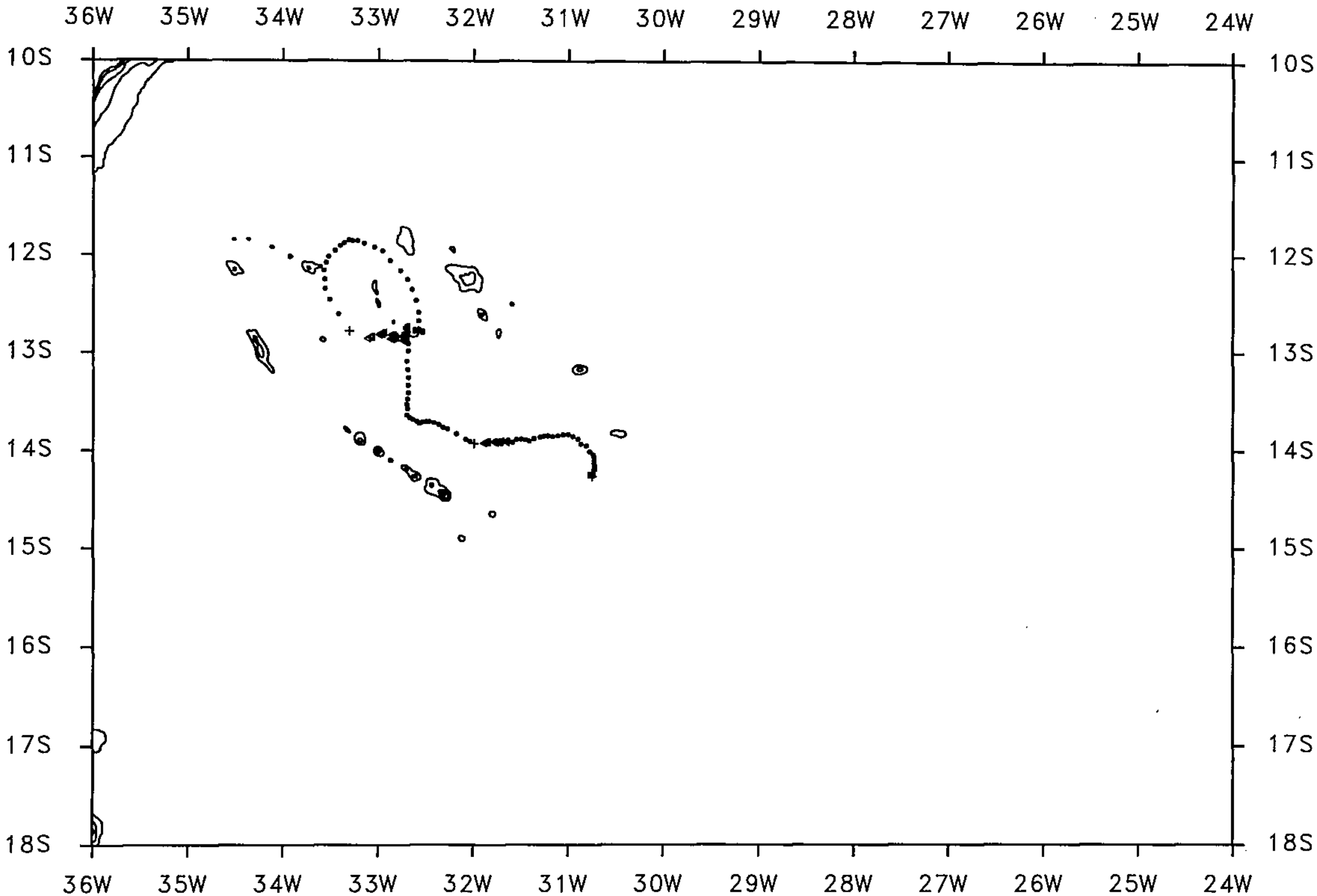
sampling interval= 24 h
number of samples= 172

average temperature= 4.36 degC

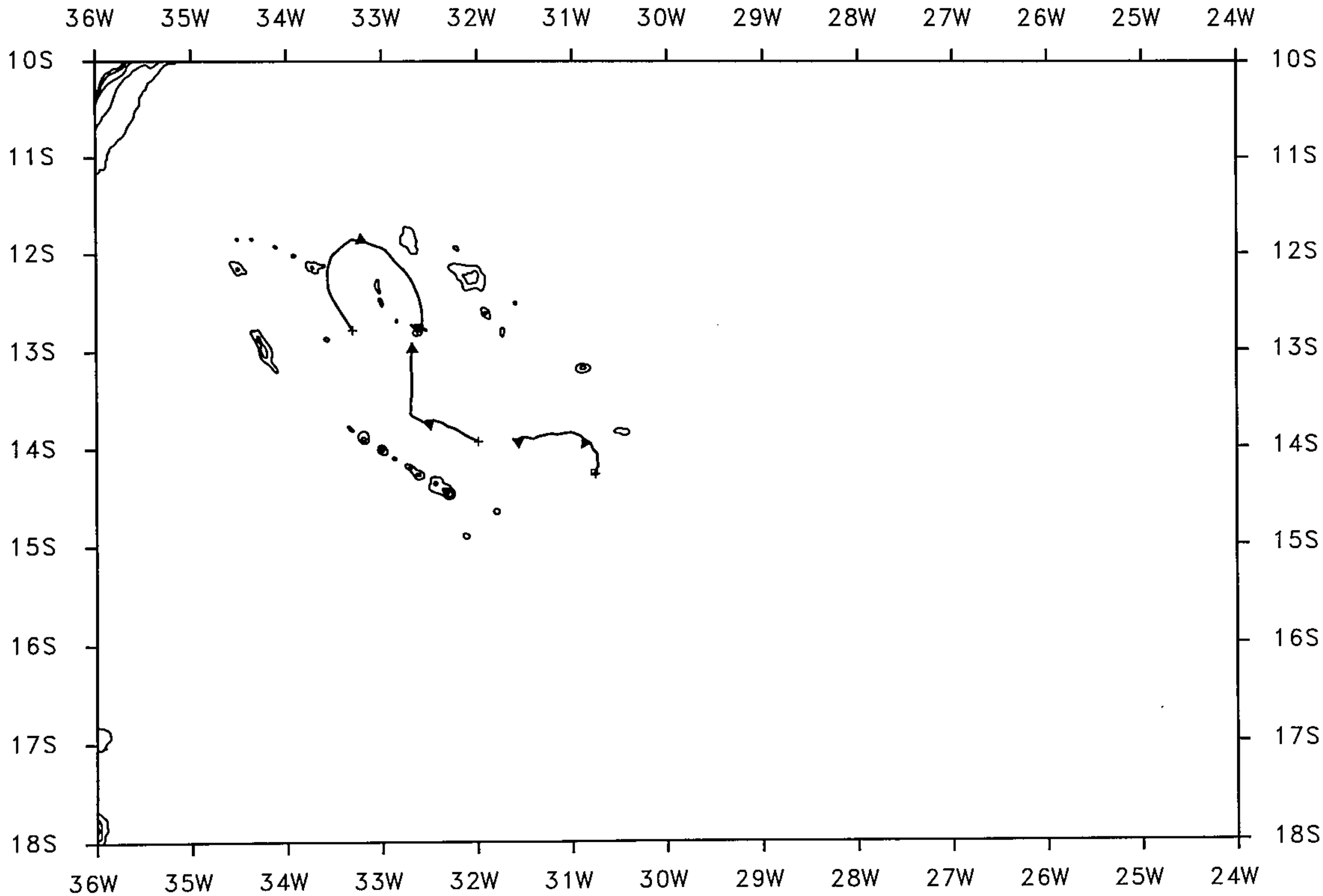
temperature variance= 0.0078 degC*degC

covar(u,temp)= -0.02 cm.degC/s
covar(v,temp)= -0.14 cm.degC/s

Comments:

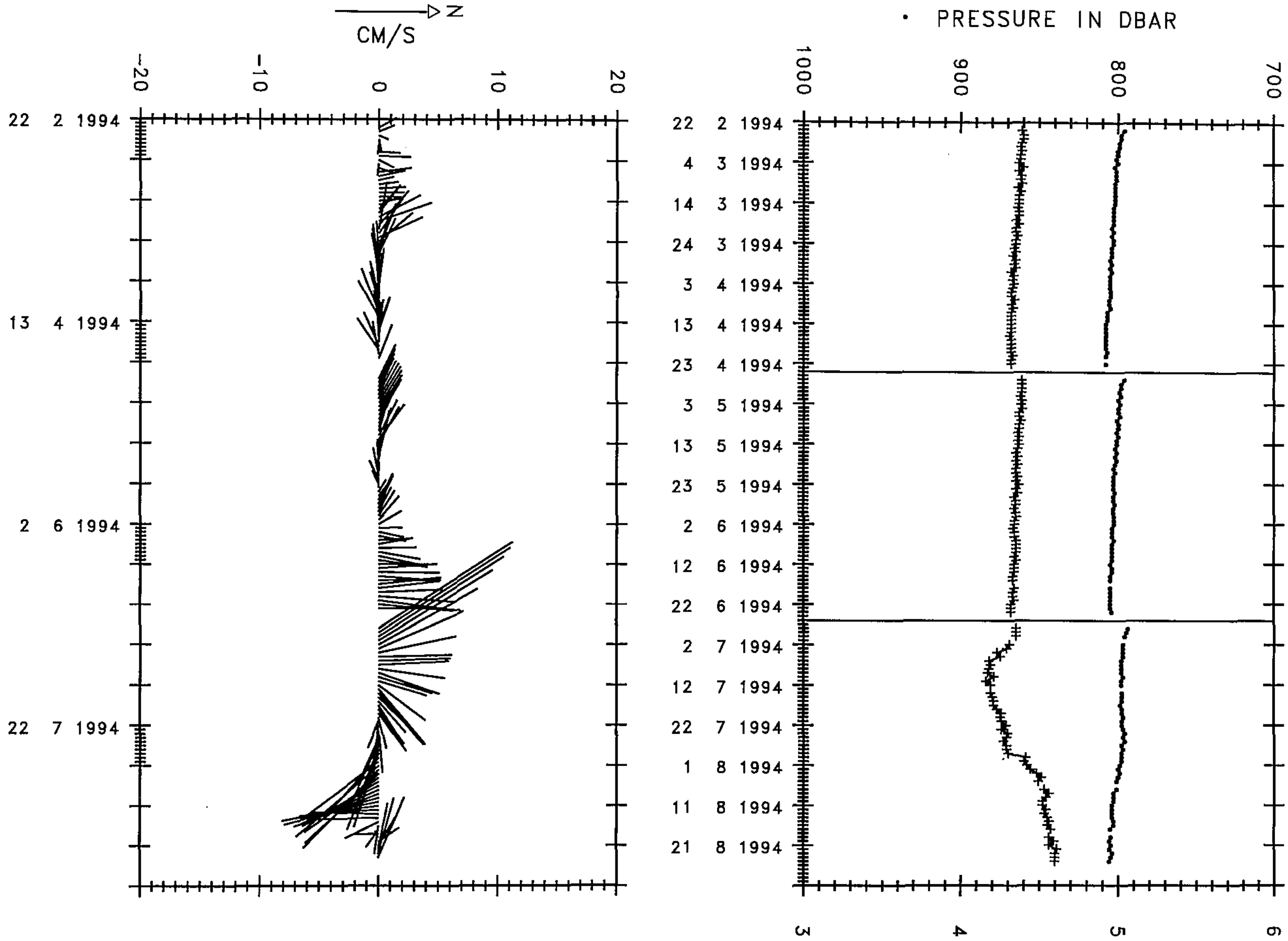


SAMBA M117 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M117 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED

SAMBA M117 CYCLES 1,2 AND 3



EXPERIMENT: SAMBA

FLOAT: m117

launch date	launch lat	launch long
1994 2 22 7h UT	14.250 S	30.768 W

file	m117-c4.fin	m117-c5.fin	m117-c6.fin
date of 1st pos	1994 8 29 (16312)	1994 10 30 (16374)	1994 12 31 (16436)
1st pos	33.000W 12.846S	33.566W 12.841S	33.005W 10.882S
last pos	33.636W 12.592S	32.853W 11.015S	34.294W 13.036S
1st P and T	800dbar 4.52degC	798dbar 4.58degC	792dbar 4.50degC
last P and T	823dbar 4.43degC	828dbar 4.37degC	824dbar 4.30degC
displacements (East and North)	-69km 28km	78km 203km	-140km -239km
mean velocities (East and North)	-1.38cm/s 0.56cm/s	1.60cm/s 4.19cm/s	-2.80cm/s -4.78cm/s
number of pos	59	43	47

Velocity time series statistics:

sampling interval= 24 h
number of samples= 149

15 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= -1.02 cm/s [-4.59, 2.56]
average north velocity comp.= -0.12 cm/s [-3.47, 3.24]

variances
variance of east velocity comp.= 42.23 cm2/s2 [12.01, 72.46]
variance of north velocity comp.= 37.14 cm2/s2 [10.56, 63.72]

covariance
covariance= -6.74 cm2/s2 [-26.78, 13.30]

Eddy Kinetic Energy
EKE= 39.69 cm2/s2 [19.56, 59.81]

Temperature time series statistics:

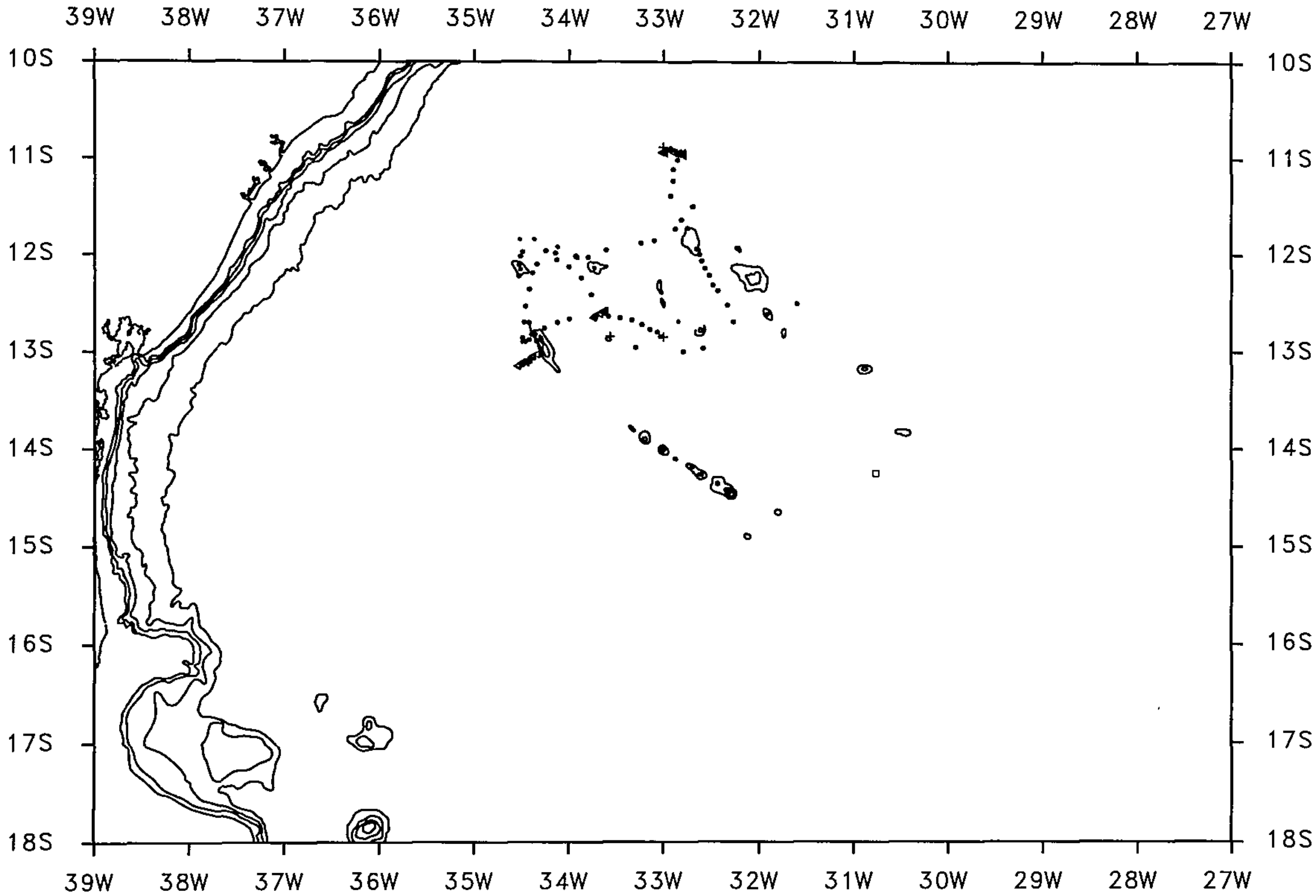
sampling interval= 24 h
number of samples= 146

average temperature= 4.49 degC

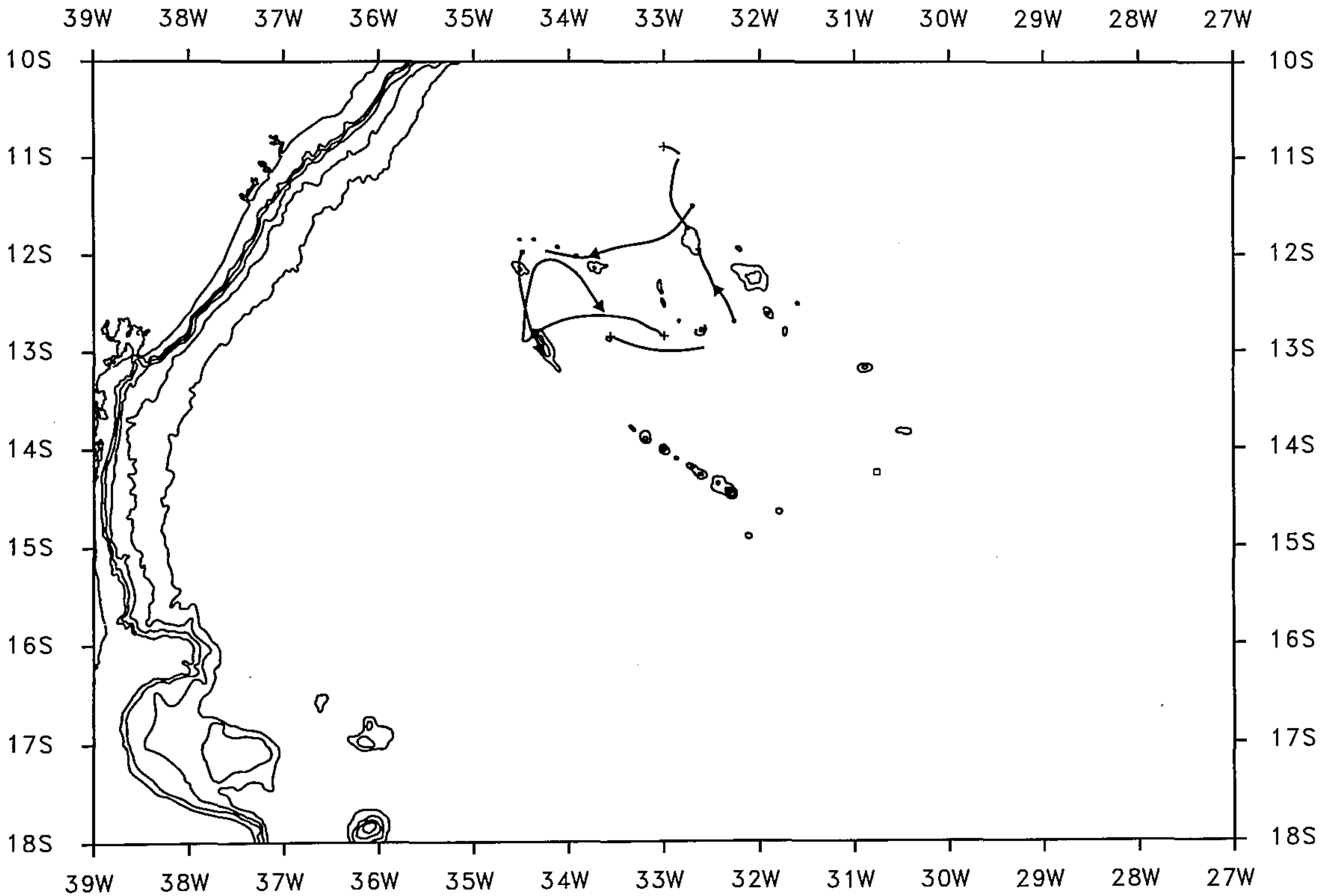
temperature variance= 0.0069 degC*degC

covar(u,temp)= -0.04 cm.degC/s
covar(v,temp)= 0.18 cm.degC/s

Comments:

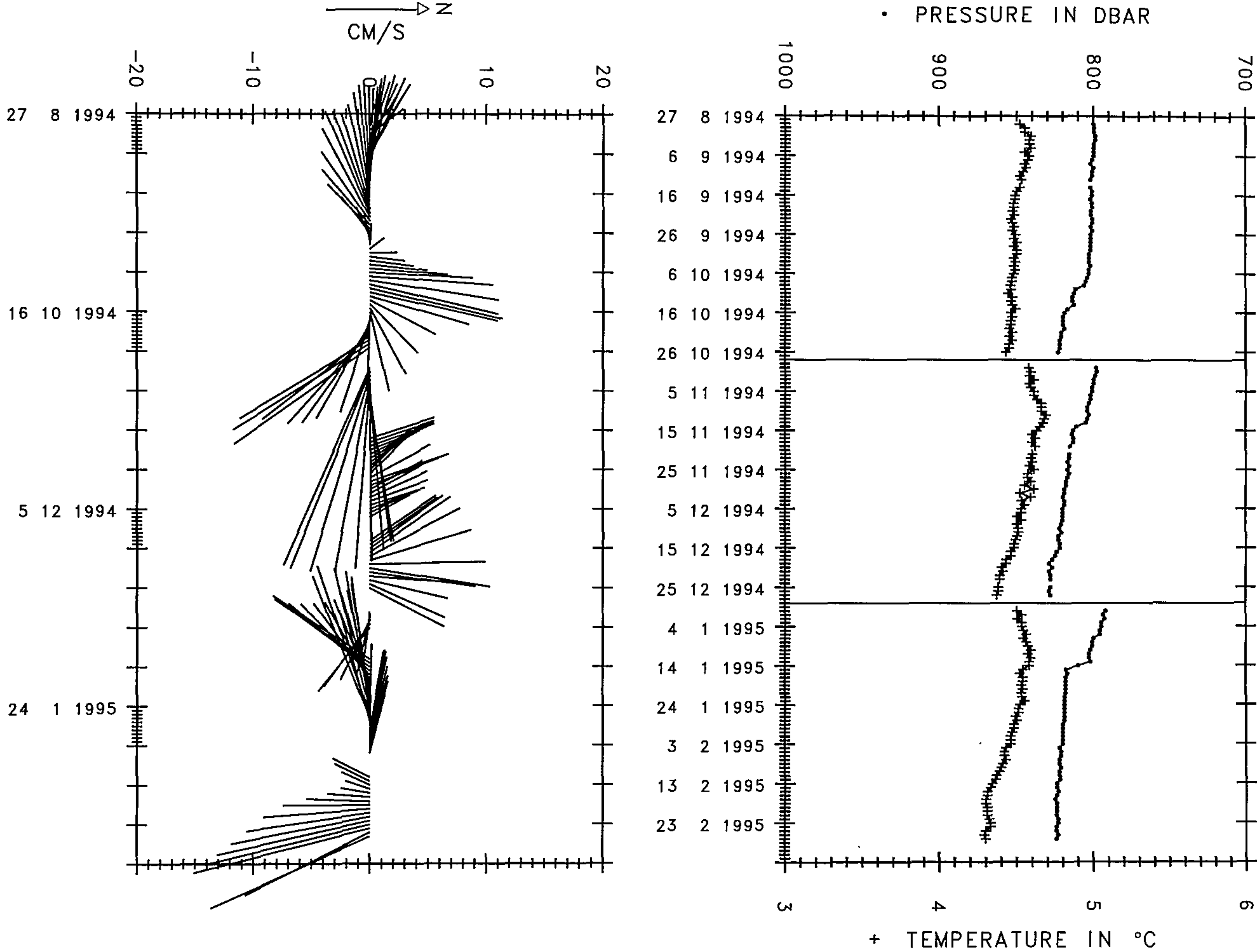


SAMBA M117 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M117 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED

SAMBA M117 CYCLES 4,5 AND 6



EXPERIMENT: SAMBA

FLOAT: m117
----

launch date	launch lat	launch long
1994 2 22 7h UT	14.250 S	30.768 W

file	m117-c7.fin	m117-c8.fin	m117-c9.fin
date of 1st pos	1995 3 2 (16497)	1995 5 3 (16559)	1995 7 4 (16621)
1st pos	34.590W 13.200S	35.053W 12.665S	34.271W 13.048S
last pos	34.890W 12.514S	34.036W 13.017S	33.573W 9.814S
1st P and T	781dbar 4.17degC	788dbar 4.35degC	792dbar 4.29degC
last P and T	966dbar 3.98degC	958dbar 4.04degC	837dbar 4.56degC
displacements (East and North)	-33km 76km	110km -39km	76km 359km
mean velocities (East and North)	-0.64cm/s 1.50cm/s	2.16cm/s -0.77cm/s	1.49cm/s 7.05cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 106

11 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.87 cm/s [-3.97, 5.71]
average north velocity comp.= 4.93 cm/s [-0.18, 10.03]

variances
variance of east velocity comp.= 53.19 cm2/s2 [8.74, 97.65]
variance of north velocity comp.= 59.28 cm2/s2 [9.74, 108.82]

covariance
covariance= -4.21 cm2/s2 [-37.39, 28.97]

Eddy Kinetic Energy
EKE= 56.23 cm2/s2 [22.95, 89.52]

Temperature time series statistics:
----

sampling interval= 24 h
number of samples= 103

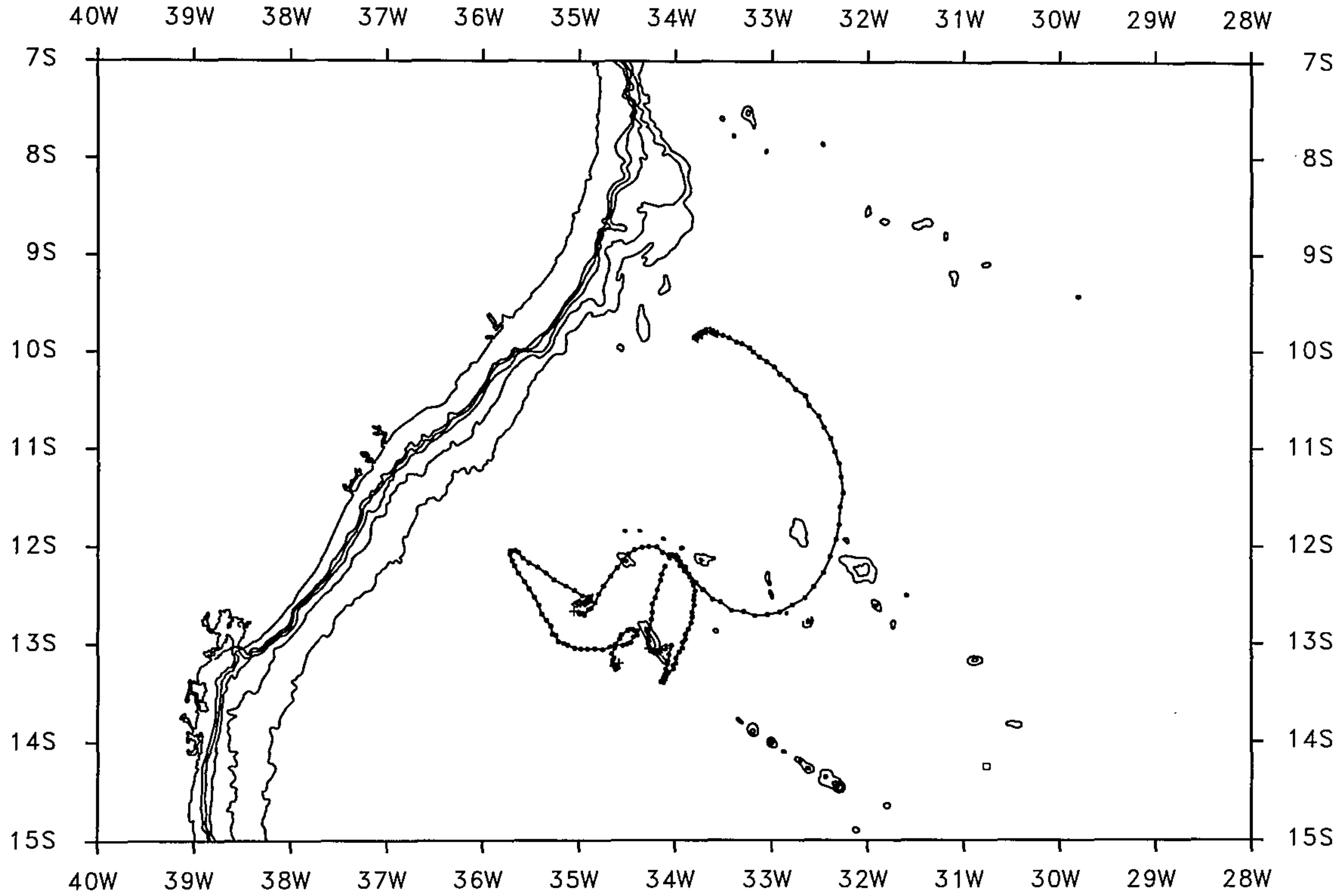
average temperature= 4.25 degC

temperature variance= 0.0209 degC*degC

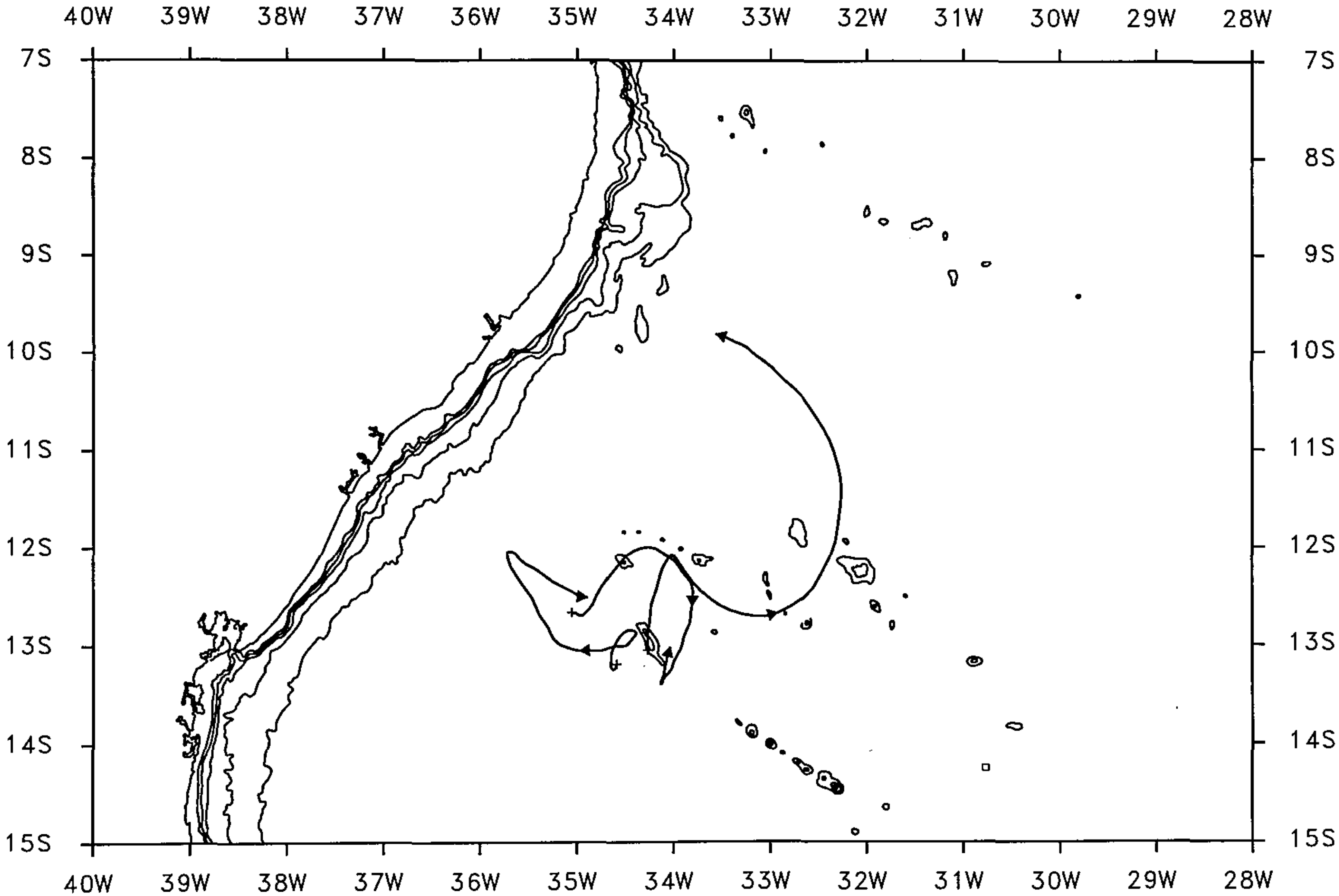
covar(u,temp)= 0.02 cm.degC/s
covar(v,temp)= -0.04 cm.degC/s

Comments:

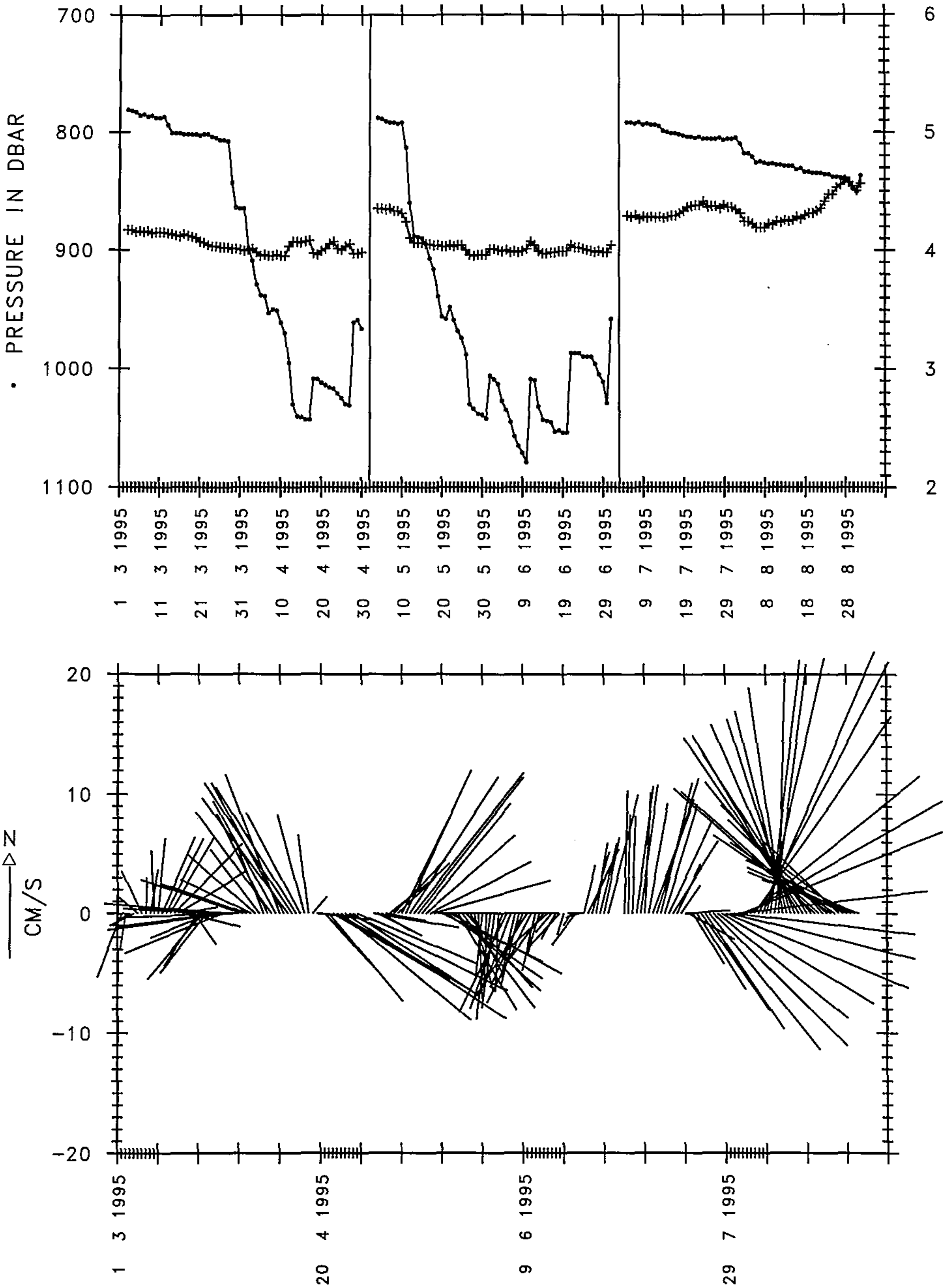
Velocity and temperature time series statistics are estimated from data within the [700,900] dbar interval.



SAMBA M117 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M117 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M117 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #118

LAUNCHED AT: 13°10.7'S 38°04.8'W on 24/02/1994 13h15 UT

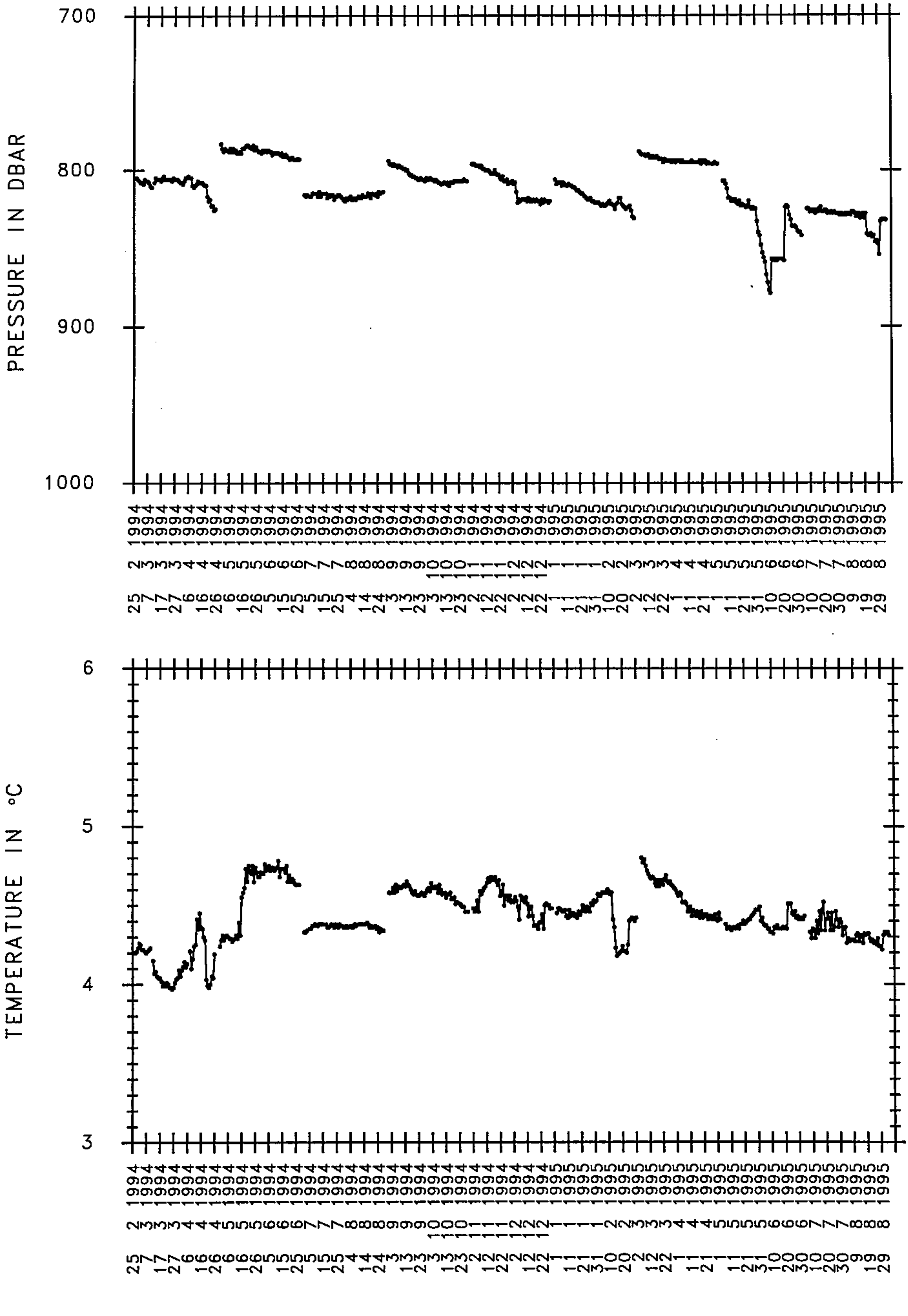
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

Comments

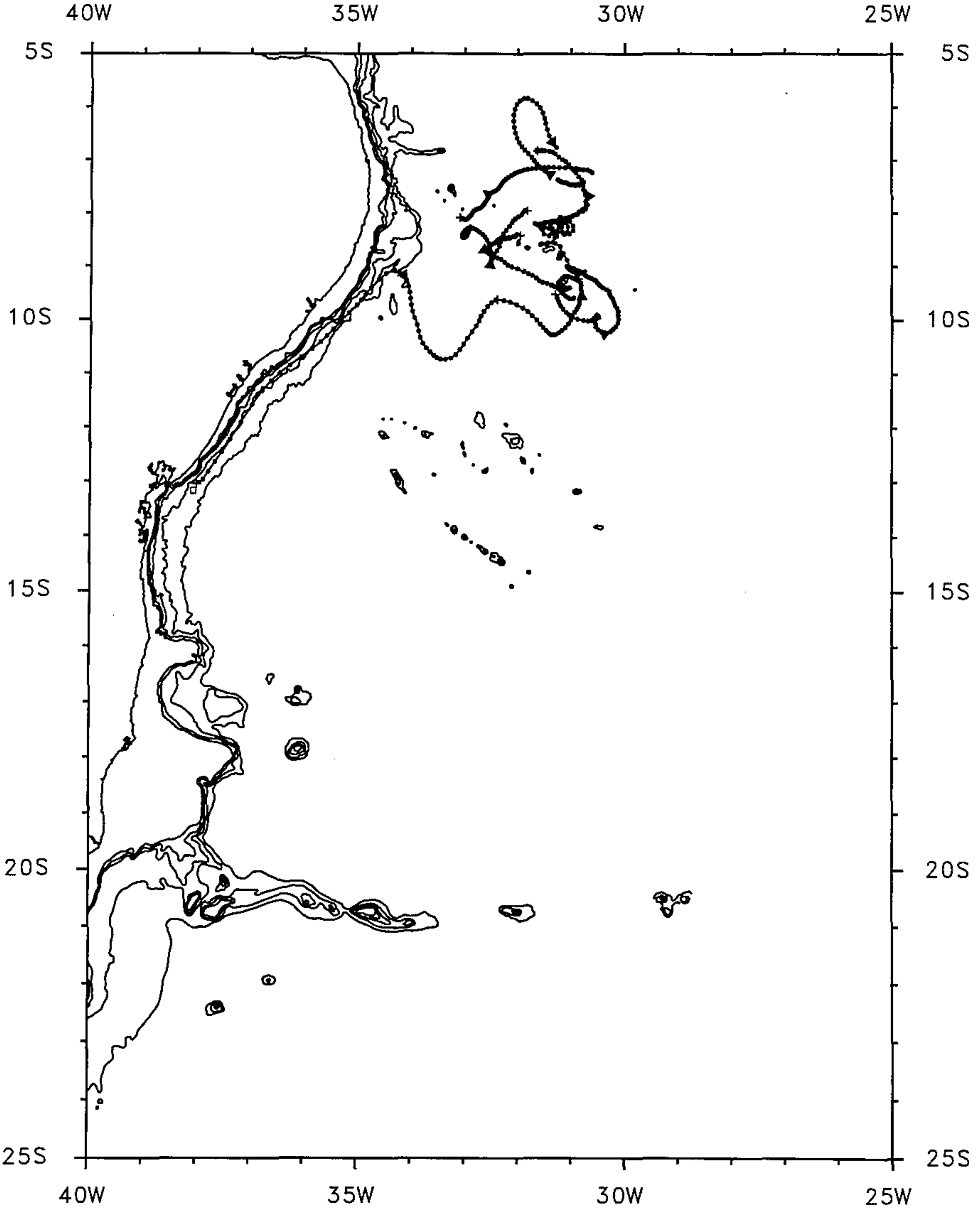
This float was launched deliberately near Salvador da Bahia in the IWBC (only presumed however at that time !). The float was detrained after 1 month from the northward flowing IWBC (the maximum velocity is of the order of 0.5 m s^{-1}) and wandered then quasi-isotropically west of Recife.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m118-c1.raw	m118-c1.fin	m118-c1.diaric
m118-c2.raw	m118-c2.fin	m118-c2.diaric
m118-c3.raw	m118-c3.fin	m118-c3.diaric
m118-c4.raw	m118-c4.fin	m118-c4.diaric
m118-c5.raw	m118-c5.fin	m118-c5.diaric
m118-c6.raw	m118-c6.fin	m118-c6.diaric
m118-c7.raw	m118-c7.fin	m118-c7.diaric
m118-c8.raw	m118-c8.fin	m118-c8.diaric
m118-c9.raw	m118-c9.fin	m118-c9.diaric



SAMBA M118 CYCLES 1 TO 9



SAMBA M118 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m118
----

launch date	launch lat	launch long
1994 2 24 13h UT	13.178 S	38.080 W

file	m118-c1.fin	m118-c2.fin	m118-c3.fin
date of 1st pos	1994 2 26 (16128)	1994 4 29 (16190)	1994 6 30 (16252)
1st pos	38.016W 13.048S	32.386W 9.618S	30.861W 9.229S
last pos	32.422W 9.625S	30.952W 9.591S	31.216W 8.075S
1st P and T	805dbar 4.20degC	783dbar 4.24degC	816dbar 4.33degC
last P and T	825dbar 4.19degC	793dbar 4.63degC	814dbar 4.34degC
displacements (East and North)	609km 380km	157km 3km	-39km 128km
mean velocities (East and North)	12.16cm/s 7.59cm/s	3.14cm/s 0.06cm/s	-0.81cm/s 2.65cm/s
number of pos	54	59	57

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 170

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 4.32 cm/s [0.00, 8.64]
average north velocity comp.= 2.68 cm/s [-2.42, 7.77]

variances
variance of east velocity comp.= 71.32 cm2/s2 [23.37, 119.27]
variance of north velocity comp.= 99.01 cm2/s2 [32.45, 165.57]

covariance
covariance= 18.25 cm2/s2 [-21.70, 58.20]

Eddy Kinetic Energy
EKE= 85.17 cm2/s2 [44.15, 126.18]

Temperature time series statistics:
----

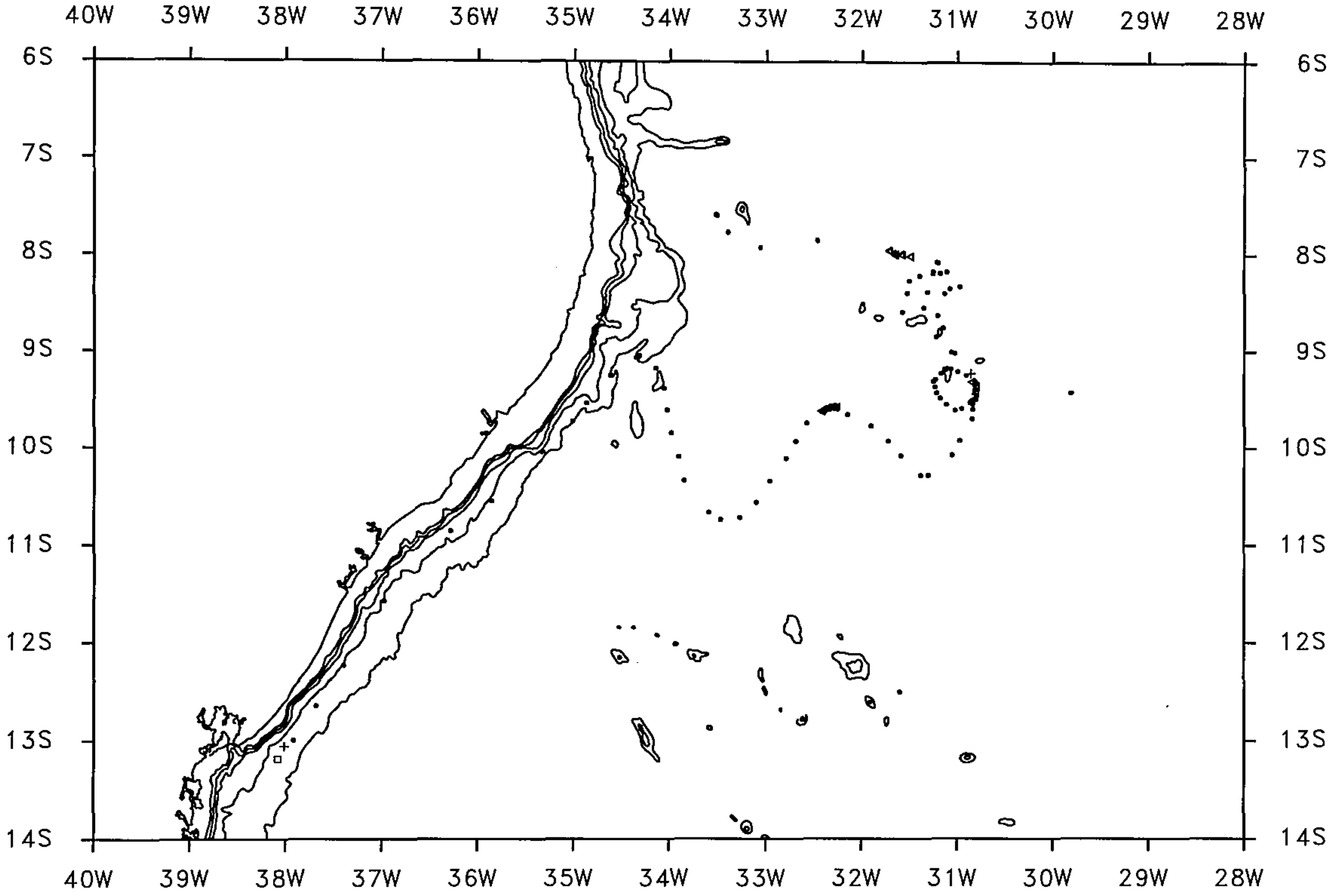
sampling interval= 24 h
number of samples= 158

average temperature= 4.37 degC

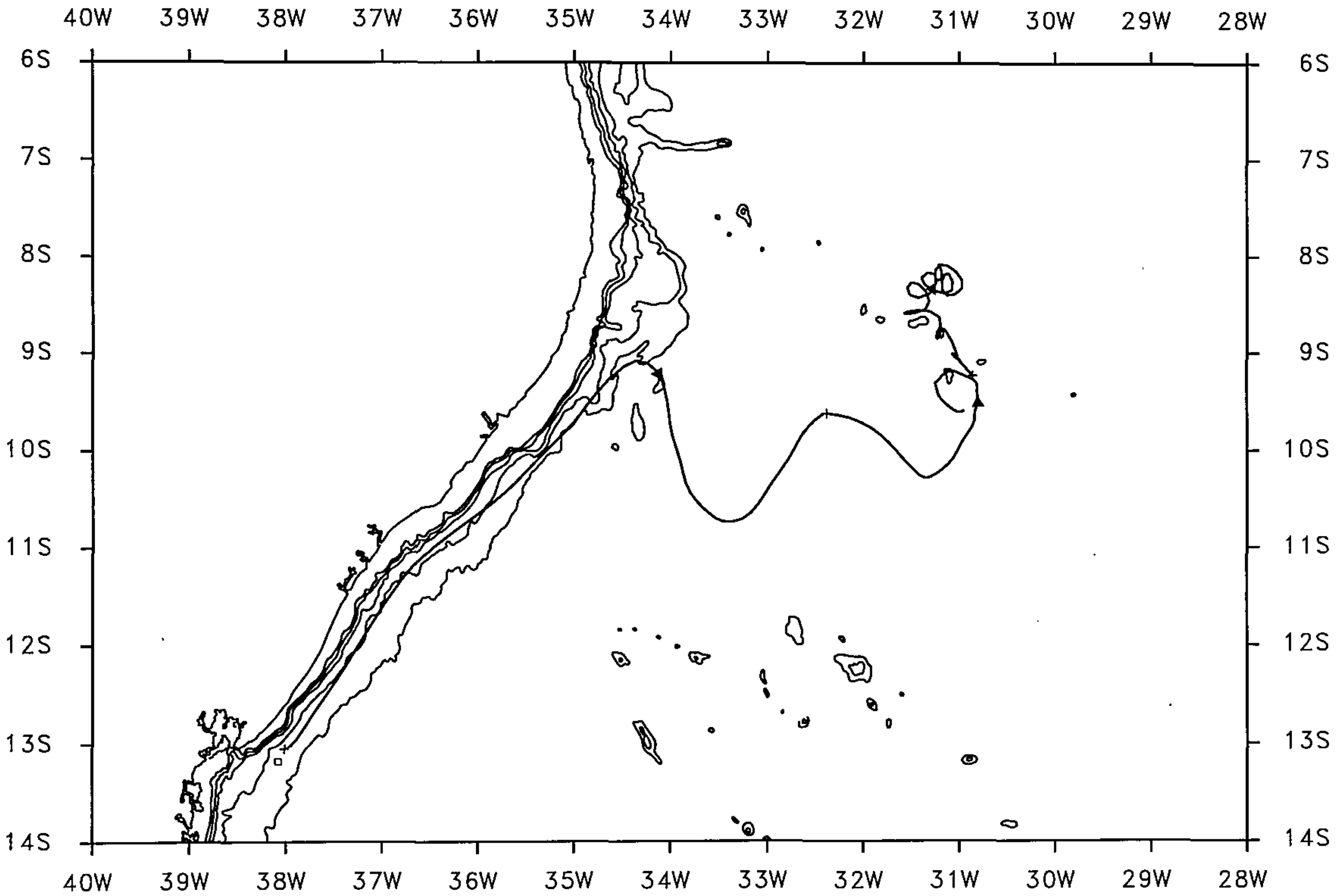
temperature variance= 0.0550 degC*degC

covar(u,temp)= -0.89 cm.degC/s
covar(v,temp)= -0.12 cm.degC/s

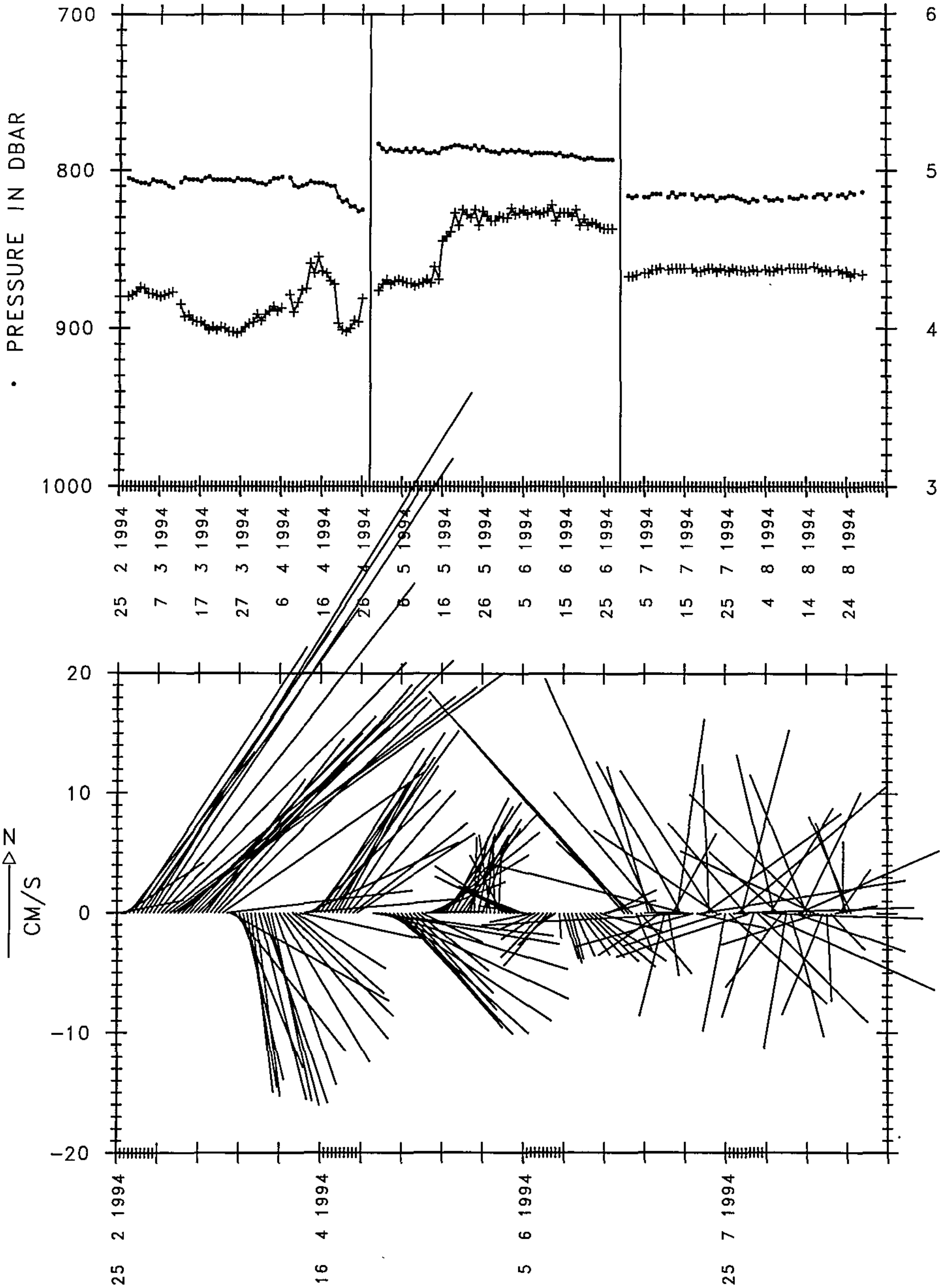
Comments:



SAMBA M118 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M118 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M118 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m118

launch date	launch lat	launch long
1994 2 24 13h UT	13.178 S	38.080 W

file	m118-c4.fin	m118-c5.fin	m118-c6.fin
date of 1st pos	1994 8 31 (16314)	1994 11 1 (16376)	1995 1 2 (16438)
1st pos	31.831W 7.956S	33.099W 8.084S	30.811W 7.423S
last pos	32.910W 8.258S	30.608W 7.232S	31.286W 6.761S
1st P and T	794dbar 4.58degC	796dbar 4.48degC	806dbar 4.45degC
last P and T	807dbar 4.46degC	820dbar 4.48degC	831dbar 4.42degC
displacements (East and North)	-119km -34km	274km 95km	-52km 74km
mean velocities (East and North)	-2.45cm/s -0.69cm/s	5.47cm/s 1.89cm/s	-1.03cm/s 1.44cm/s
number of pos	57	59	55

Velocity time series statistics:

sampling interval= 24 h
number of samples= 171

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.85 cm/s [-1.88, 3.58]
average north velocity comp.= 0.80 cm/s [-2.12, 3.73]

variances
variance of east velocity comp.= 28.48 cm2/s2 [9.33, 47.63]
variance of north velocity comp.= 32.64 cm2/s2 [10.70, 54.58]

covariance
covariance= -2.93 cm2/s2 [-17.43, 11.56]

Eddy Kinetic Energy
EKE= 30.56 cm2/s2 [16.00, 45.12]

Temperature time series statistics:

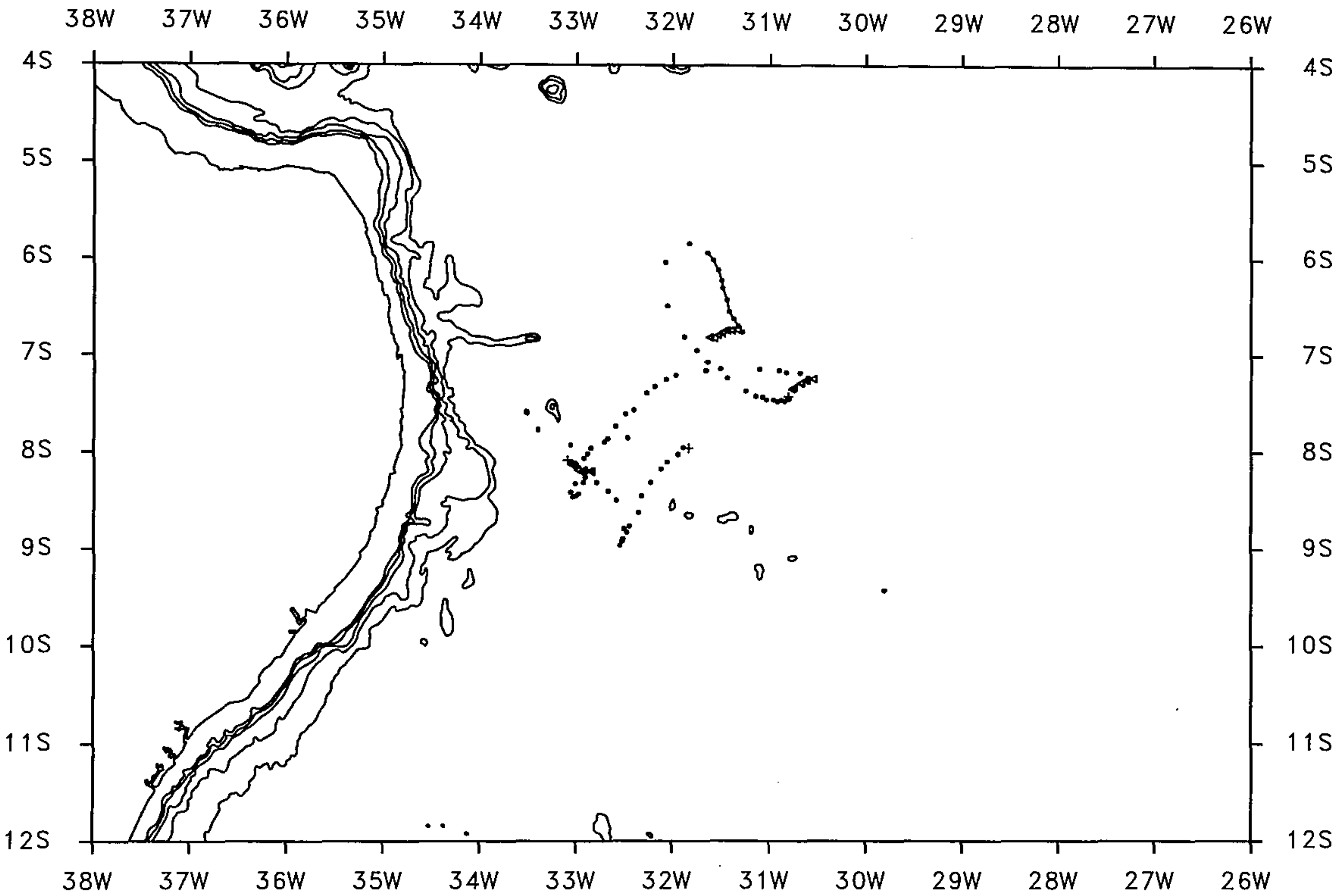
sampling interval= 24 h
number of samples= 166

average temperature= 4.51 degC

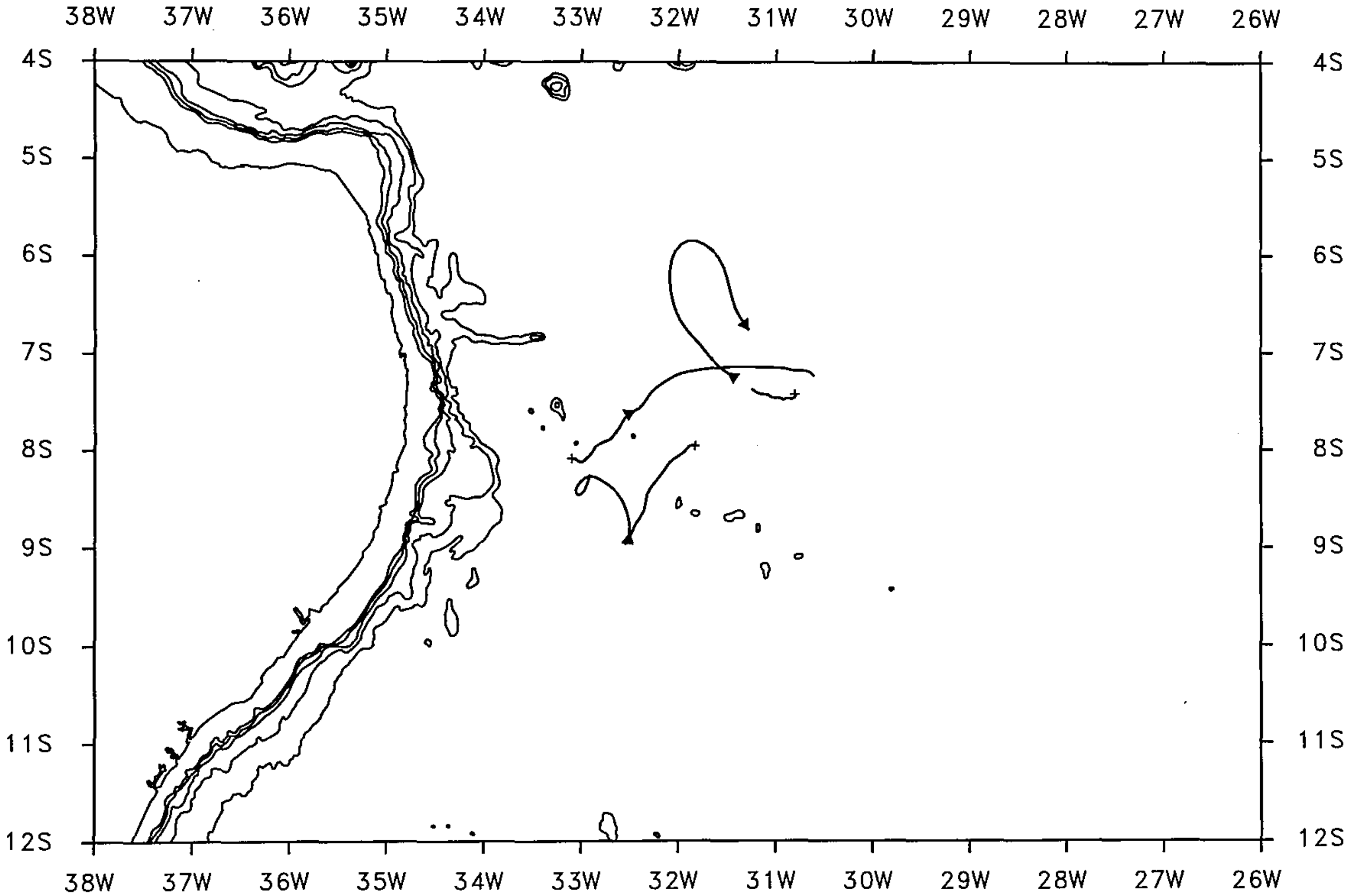
temperature variance= 0.0117 degC*degC

covar(u,temp)= -0.29 cm.degC/s
covar(v,temp)= 0.10 cm.degC/s

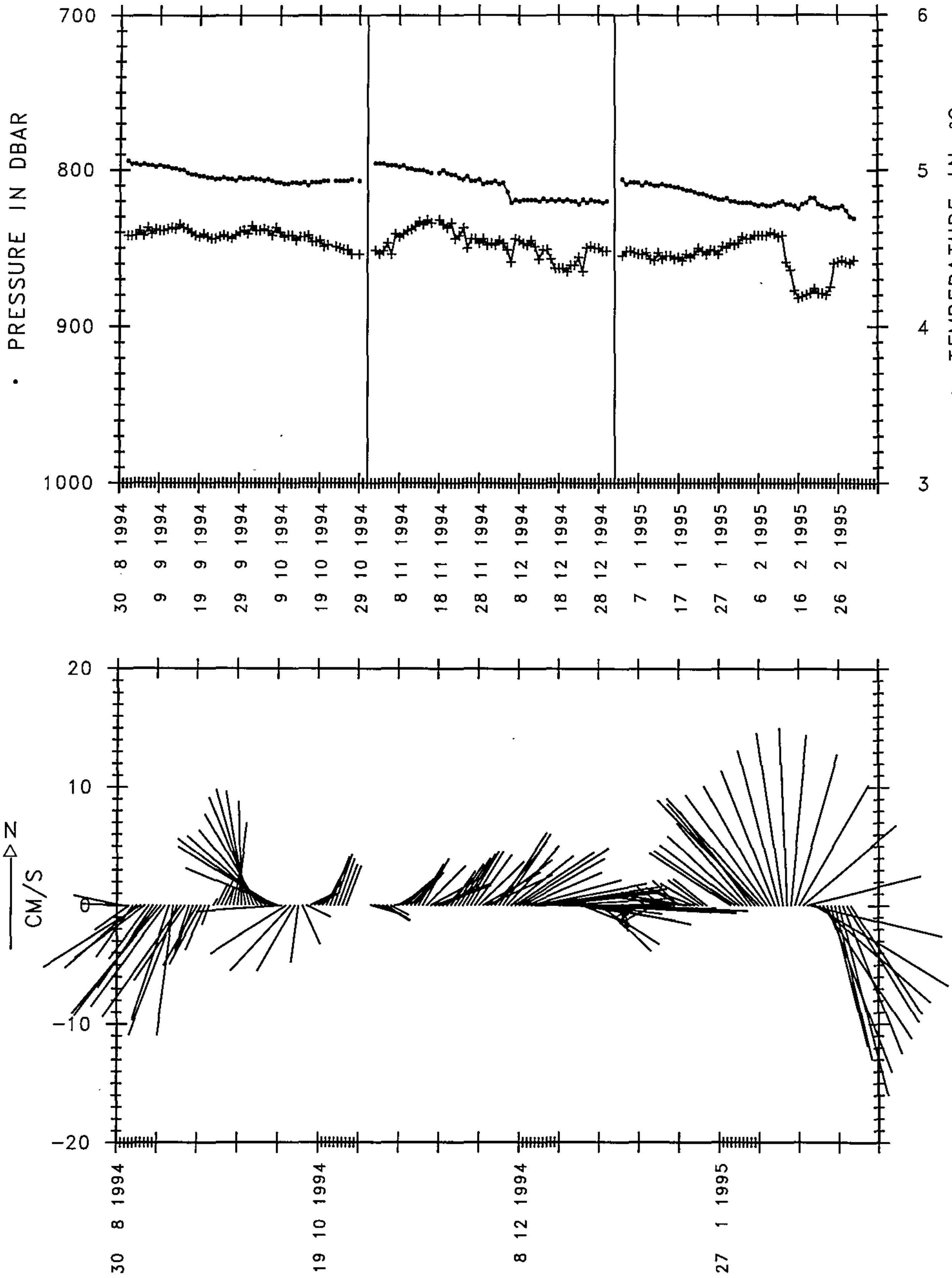
Comments:



SAMBA M118 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M118 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M118 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m118

launch date	launch lat	launch long
1994 2 24 13h UT	13.178 S	38.080 W

file	m118-c7.fin	m118-c8.fin	m118-c9.fin
date of 1st pos	1995 3 5 (16500)	1995 5 6 (16562)	1995 7 7 (16624)
1st pos	31.634W 6.825S	31.962W 8.420S	31.293W 9.518S
last pos	31.694W 8.197S	31.031W 9.402S	30.954W 9.039S
1st P and T	788dbar 4.80degC	807dbar 4.38degC	825dbar 4.33degC
last P and T	796dbar 4.41degC	842dbar 4.43degC	832dbar 4.31degC
displacements (East and North)	-7km -152km	102km -109km	37km 53km
mean velocities (East and North)	-0.13cm/s -2.99cm/s	2.00cm/s -2.14cm/s	0.73cm/s 1.04cm/s
number of pos	60	60	60

Velocity time series statistics:

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.83 cm/s [-1.88, 3.54]
average north velocity comp.= -1.34 cm/s [-3.37, 0.69]

variances
variance of east velocity comp.= 29.97 cm2/s2 [10.39, 49.55]
variance of north velocity comp.= 16.86 cm2/s2 [5.84, 27.87]

covariance
covariance= -9.08 cm2/s2 [-19.47, 1.30]

Eddy Kinetic Energy
EKE= 23.41 cm2/s2 [12.18, 34.65]

Temperature time series statistics:

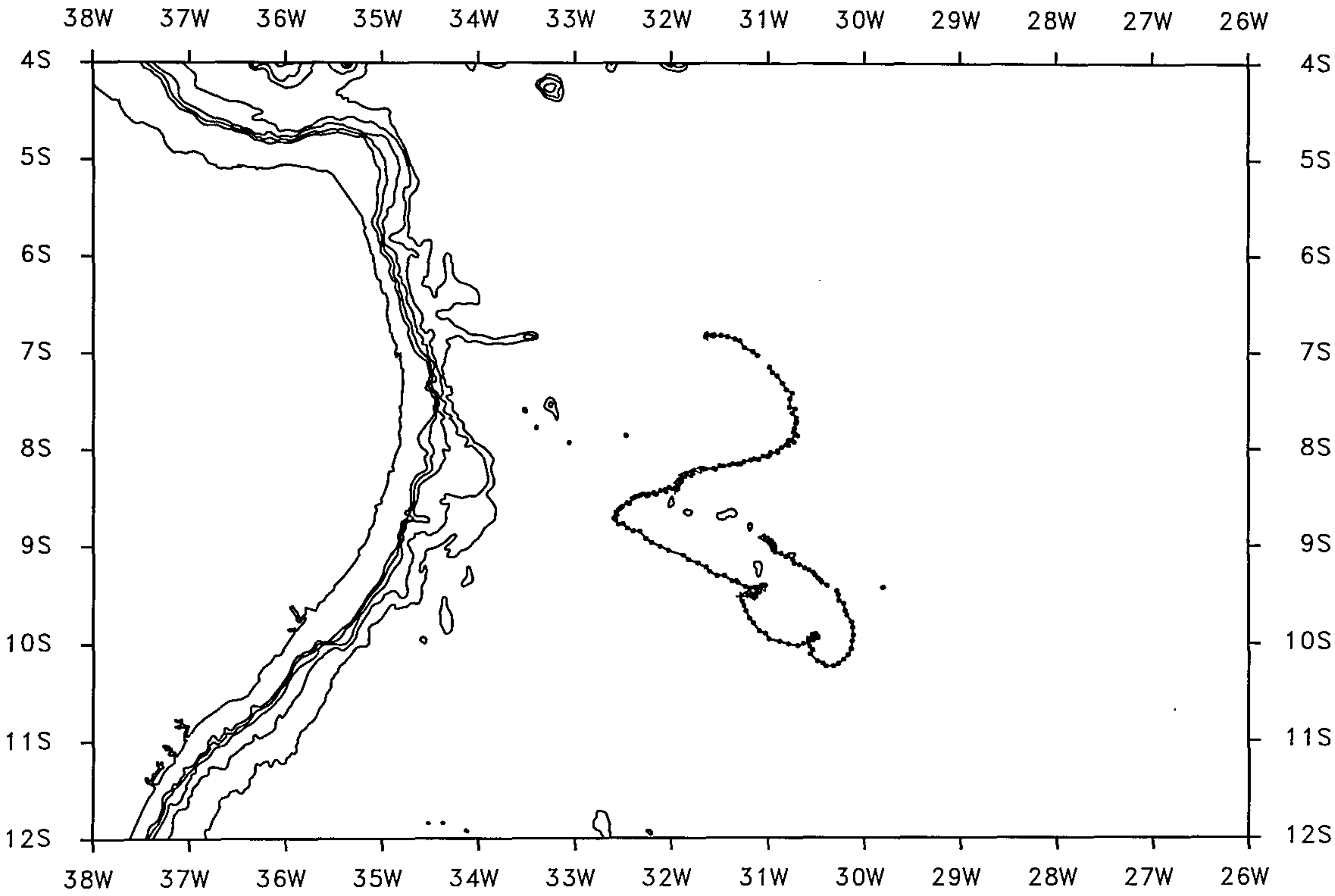
sampling interval= 24 h
number of samples= 177

average temperature= 4.43 degC

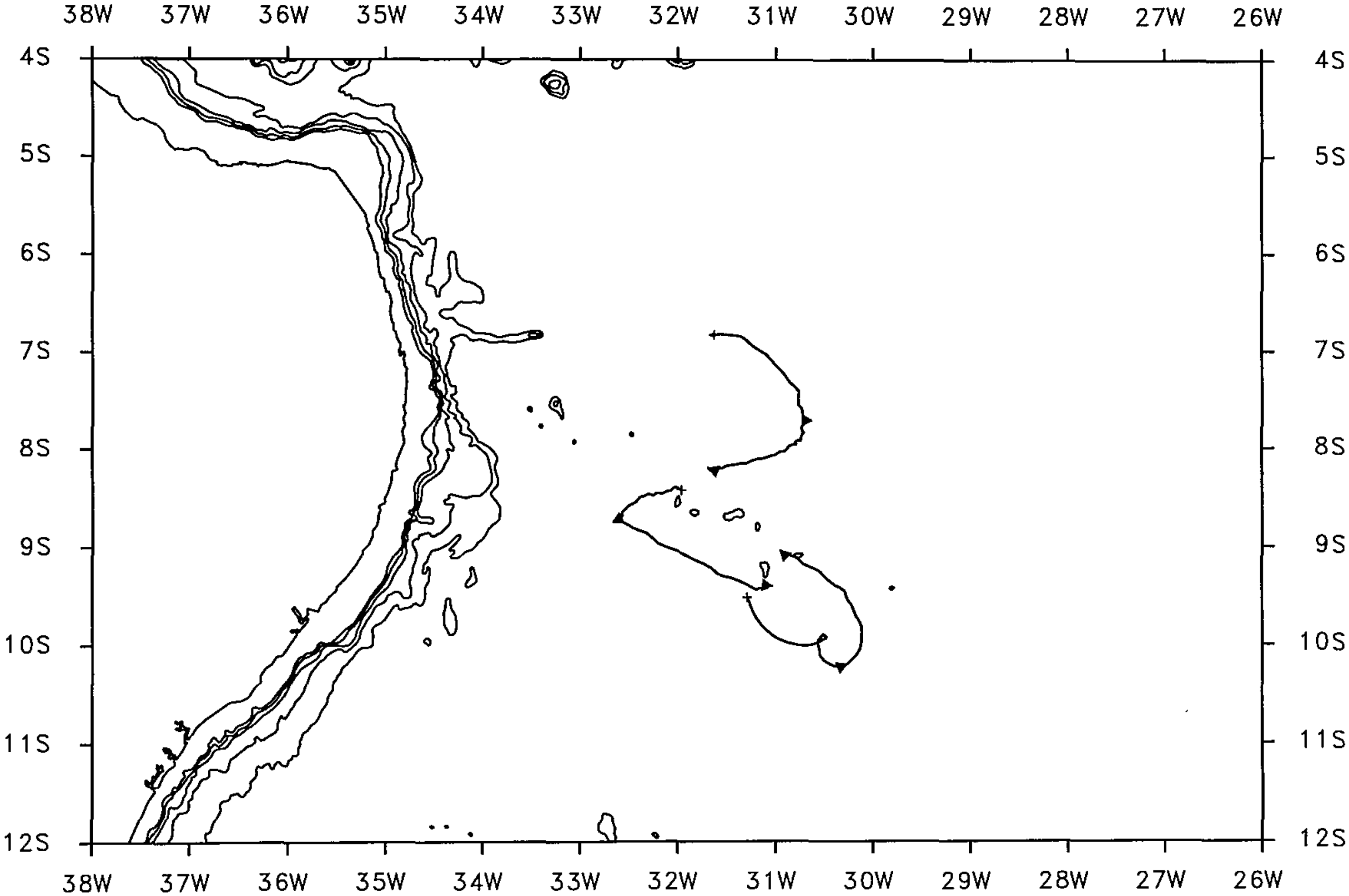
temperature variance= 0.0158 degC*degC

covar(u,temp)= 0.14 cm.degC/s
covar(v,temp)= -0.21 cm.degC/s

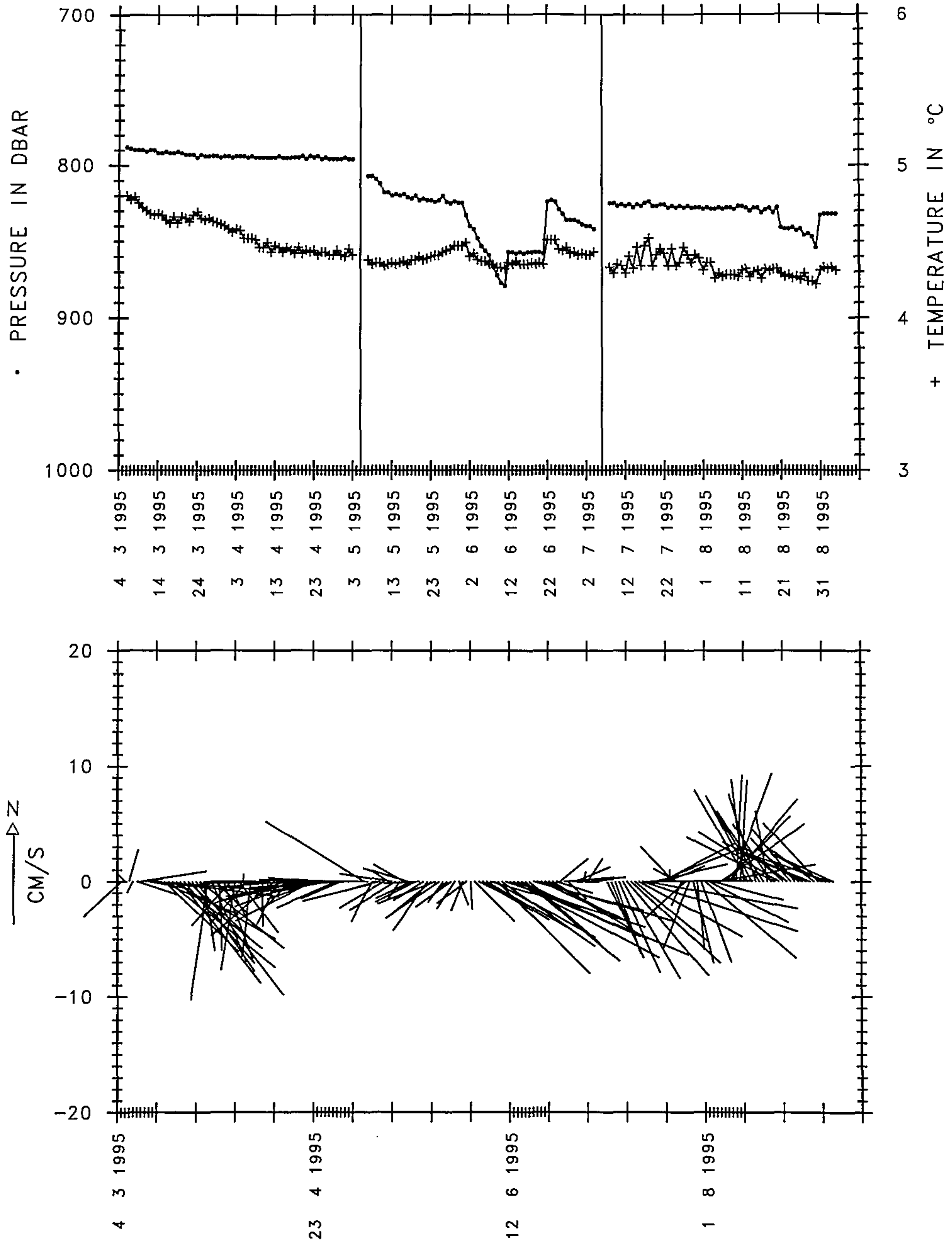
Comments:



SAMBA M118 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M118 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED



SAMBA M118 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #119

LAUNCHED AT: 14°01.5'S 31°00.0'W on 22/02/1994 14h02 UT

Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

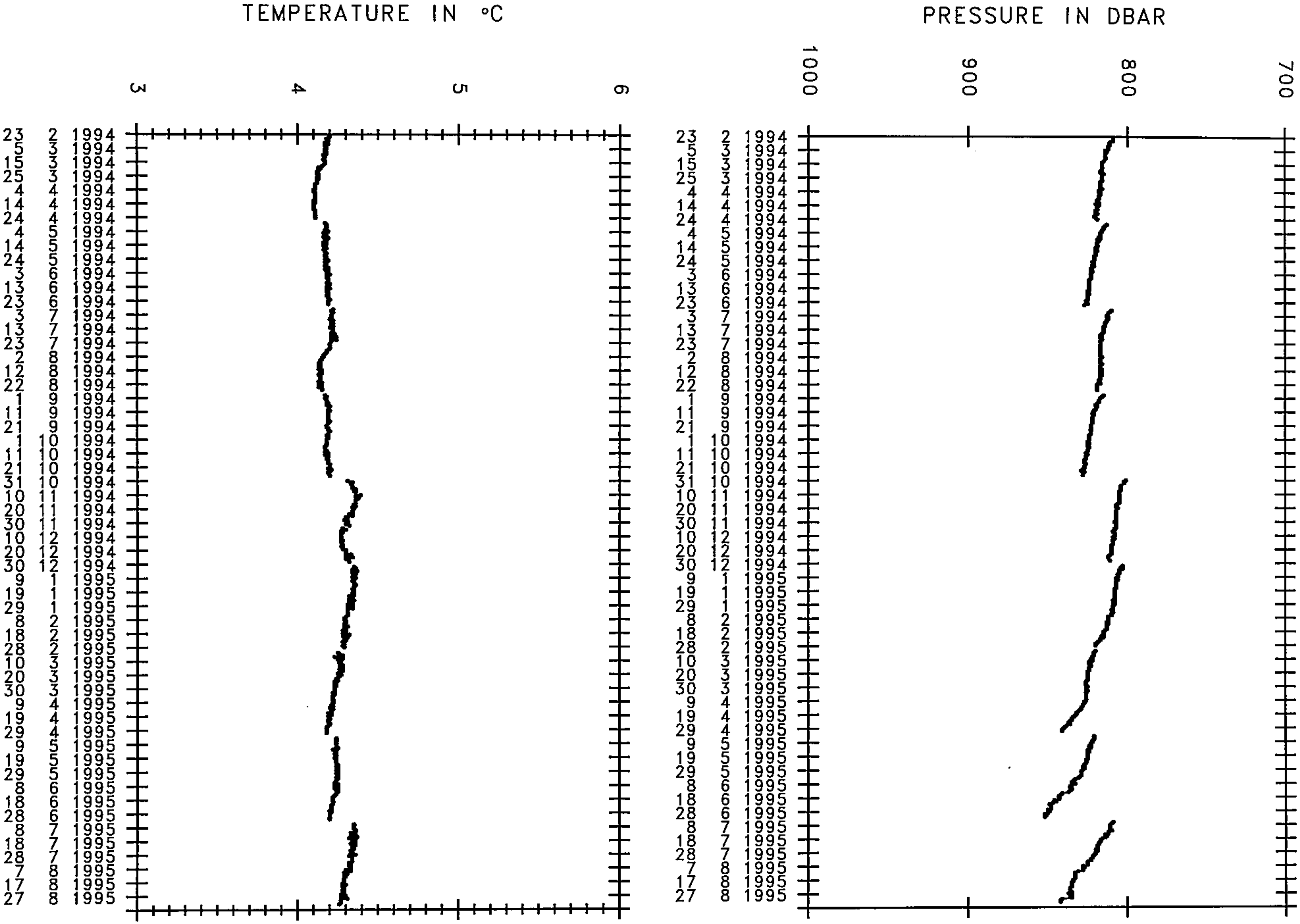
Comments

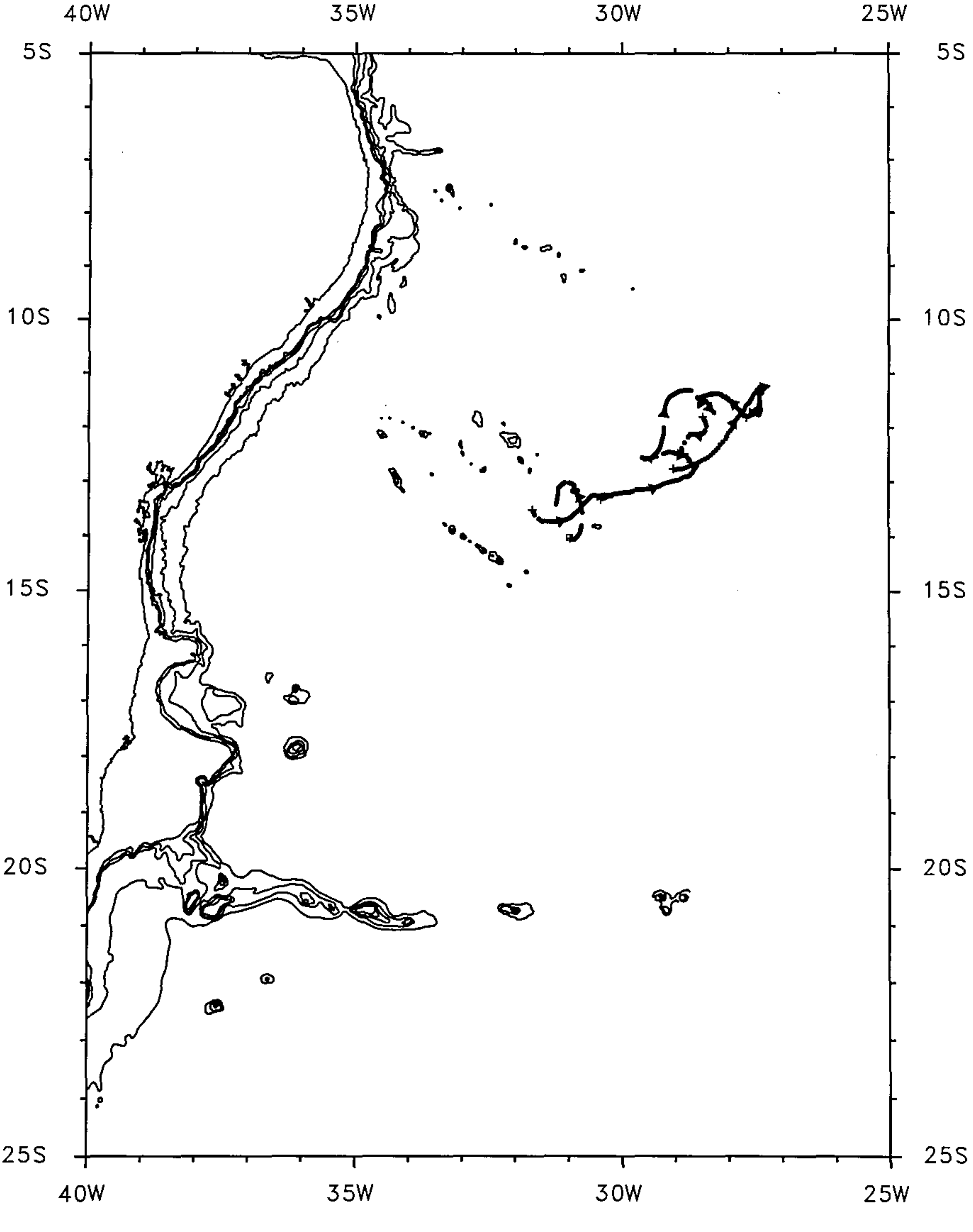
This float showed a mean northeastward flow.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m119-c1.raw	m119-c1.fin	m119-c1.diaric
m119-c2.raw	m119-c2.fin	m119-c2.diaric
m119-c3.raw	m119-c3.fin	m119-c3.diaric
m119-c4.raw	m119-c4.fin	m119-c4.diaric
m119-c5.raw	m119-c5.fin	m119-c5.diaric
m119-c6.raw	m119-c6.fin	m119-c6.diaric
m119-c7.raw	m119-c7.fin	m119-c7.diaric
m119-c8.raw	m119-c8.fin	m119-c8.diaric
m119-c9.raw	m119-c9.fin	m119-c9.diaric

SAMBA M119 CYCLES 1 TO 9





SAMBA M119 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m119

launch date	launch lat	launch long
1994 2 22 14h UT	14.025 S	31.000 W

file	m119-c1.fin	m119-c2.fin	m119-c3.fin
date of 1st pos	1994 2 26 (16128)	1994 5 1 (16192)	1994 6 28 (16250)
1st pos	30.986W 14.037S	31.679W 13.523S	30.408W 13.326S
last pos	31.240W 13.424S	30.200W 13.265S	28.599W 12.675S
1st P and T	809dbar 4.20degC	813dbar 4.17degC	810dbar 4.22degC
last P and T	819dbar 4.11degC	827dbar 4.19degC	819dbar 4.15degC
displacements (East and North)	-27km 68km	160km 29km	196km 72km
mean velocities (East and North)	-0.57cm/s 1.41cm/s	3.43cm/s 0.61cm/s	3.91cm/s 1.44cm/s
number of pos	47	50	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 156

16 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 2.45 cm/s [0.99, 3.91]
average north velocity comp.= 1.10 cm/s [-0.21, 2.41]

variances
variance of east velocity comp.= 7.60 cm2/s2 [2.33, 12.86]
variance of north velocity comp.= 6.11 cm2/s2 [1.88, 10.35]

covariance
covariance= 0.24 cm2/s2 [-3.10, 3.58]

Eddy Kinetic Energy
EKE= 6.85 cm2/s2 [3.48, 10.23]

Temperature time series statistics:

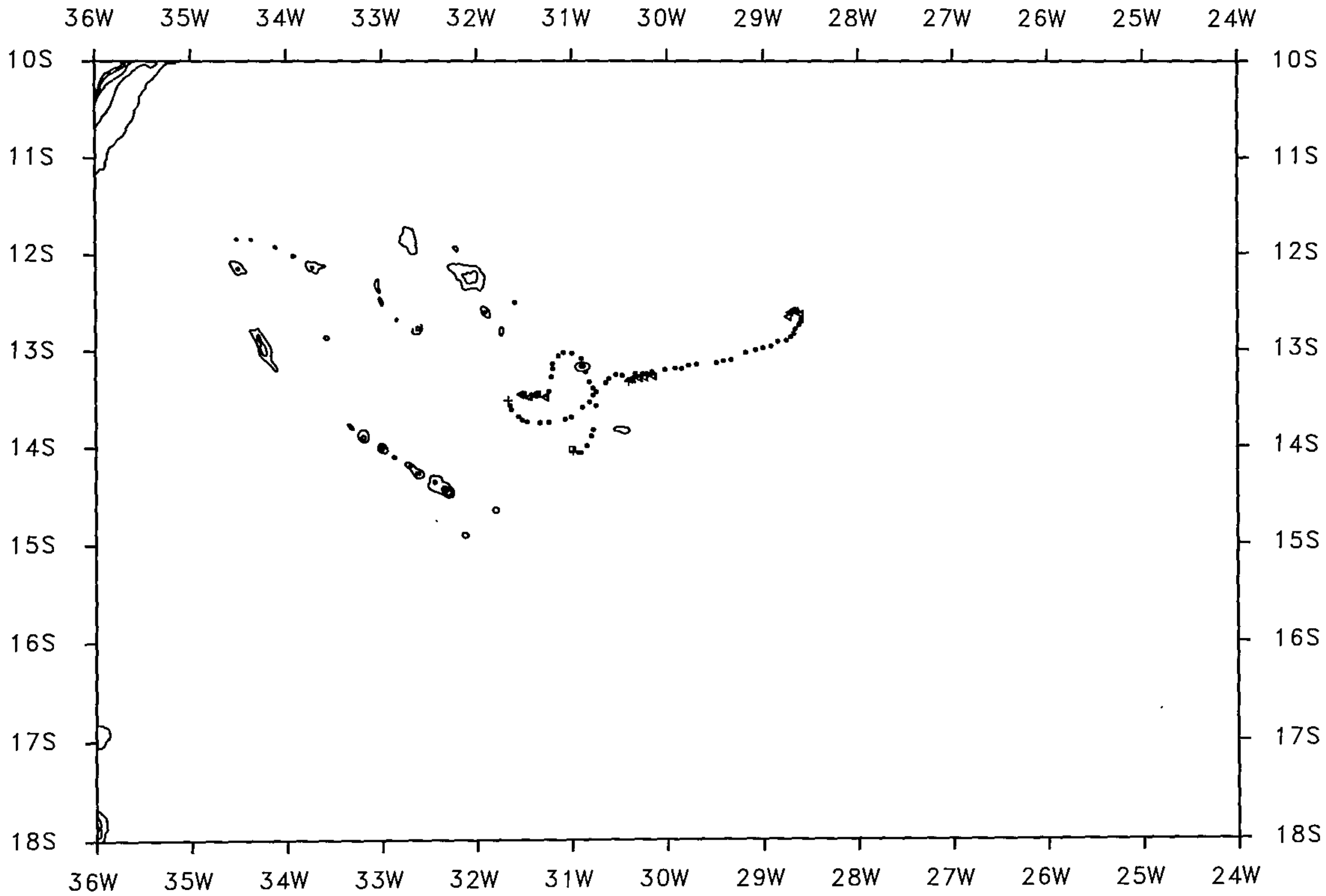
sampling interval= 24 h
number of samples= 153

average temperature= 4.17 degC

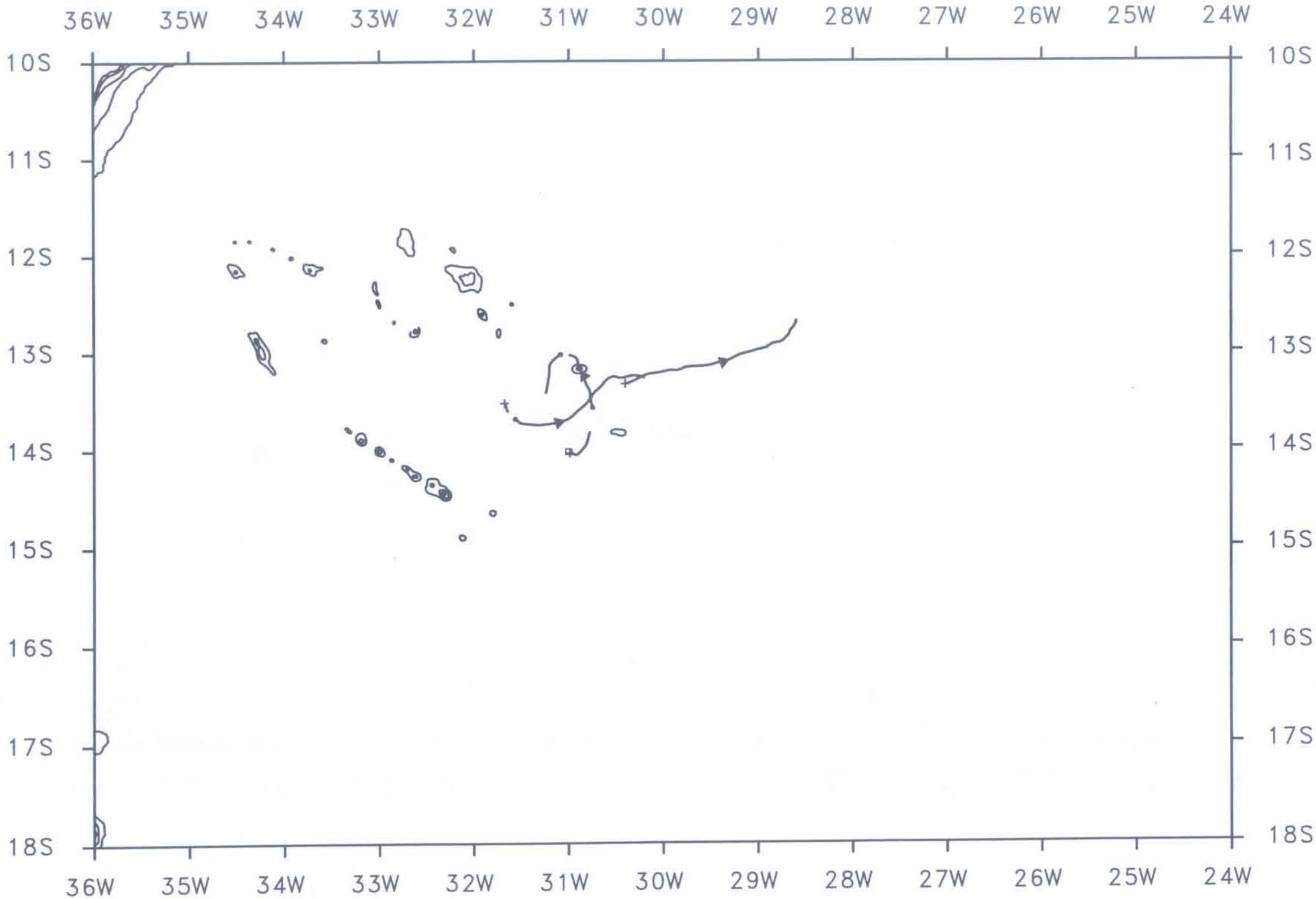
temperature variance= 0.0012 degC*degC

covar(u,temp)= 0.07 cm.degC/s
covar(v,temp)= 0.02 cm.degC/s

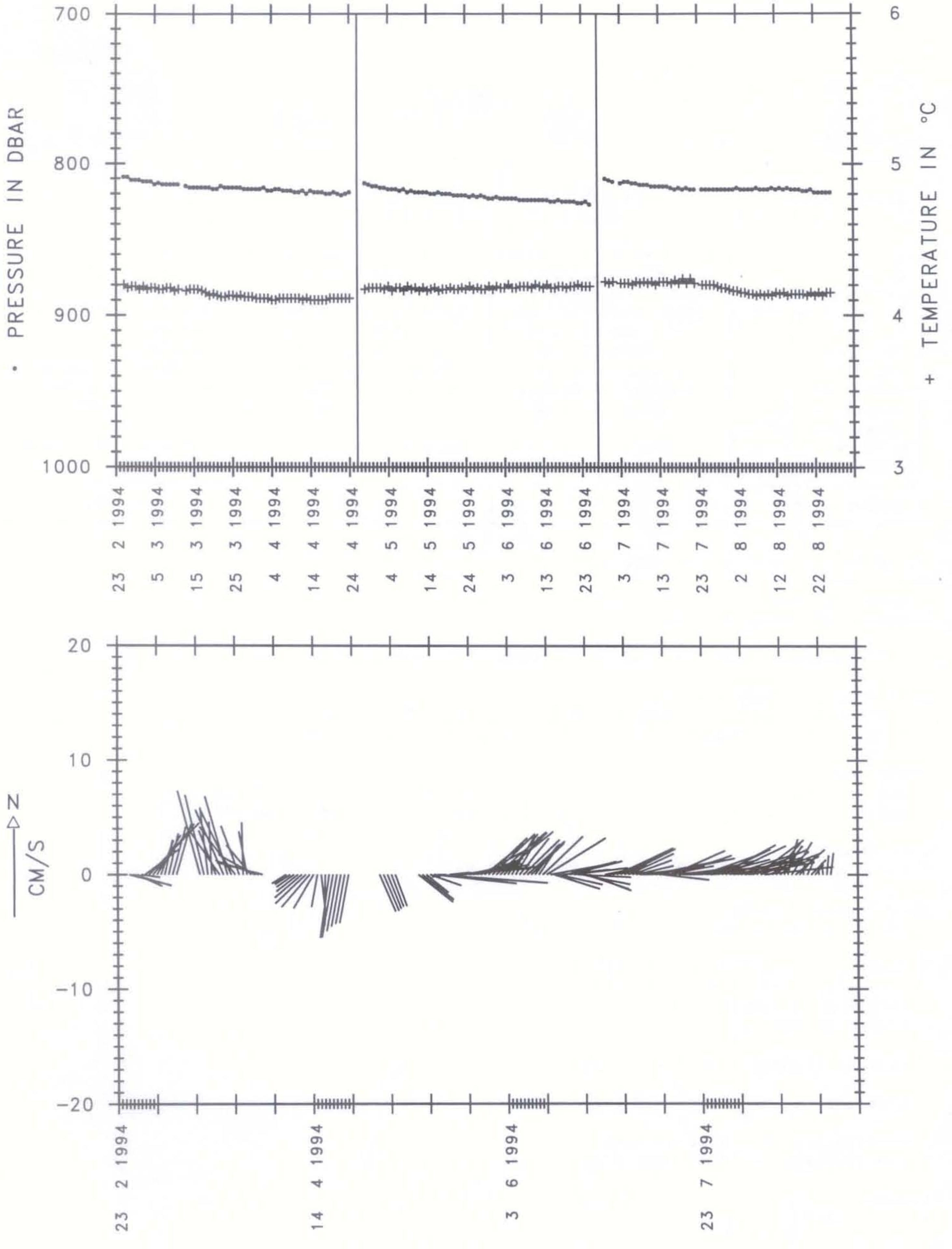
Comments:



SAMBA M119 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M119 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED



SAMBA M119 CYCLES 1,2 AND 3

EXPERIMENT: SAMBA

FLOAT: m119

launch date	launch lat	launch long
1994 2 22 14h UT	14.025 S	31.000 W

file	m119-c4.fin	m119-c5.fin	m119-c6.fin
date of 1st pos	1994 8 29 (16312)	1994 10 30 (16374)	1994 12 31 (16436)
1st pos	28.713W 12.640S	29.459W 12.585S	28.480W 11.803S
last pos	29.589W 12.582S	28.268W 11.721S	28.792W 12.516S
1st P and T	815dbar 4.17degC	801dbar 4.31degC	803dbar 4.35degC
last P and T	828dbar 4.20degC	811dbar 4.32degC	820dbar 4.29degC
displacements (East and North)	-95km 6km	129km 96km	-34km -79km
mean velocities (East and North)	-1.96cm/s 0.13cm/s	2.54cm/s 1.88cm/s	-0.66cm/s -1.55cm/s
number of pos	35	50	45

Velocity time series statistics:

sampling interval= 24 h
number of samples= 128

13 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.41 cm/s [-1.06, 1.87]
average north velocity comp.= 0.37 cm/s [-1.24, 1.98]

variances
variance of east velocity comp.= 5.97 cm2/s2 [1.38, 10.56]
variance of north velocity comp.= 7.20 cm2/s2 [1.67, 12.74]

covariance
covariance= 0.27 cm2/s2 [-3.30, 3.83]

Eddy Kinetic Energy
EKE= 6.59 cm2/s2 [2.99, 10.18]

Temperature time series statistics:

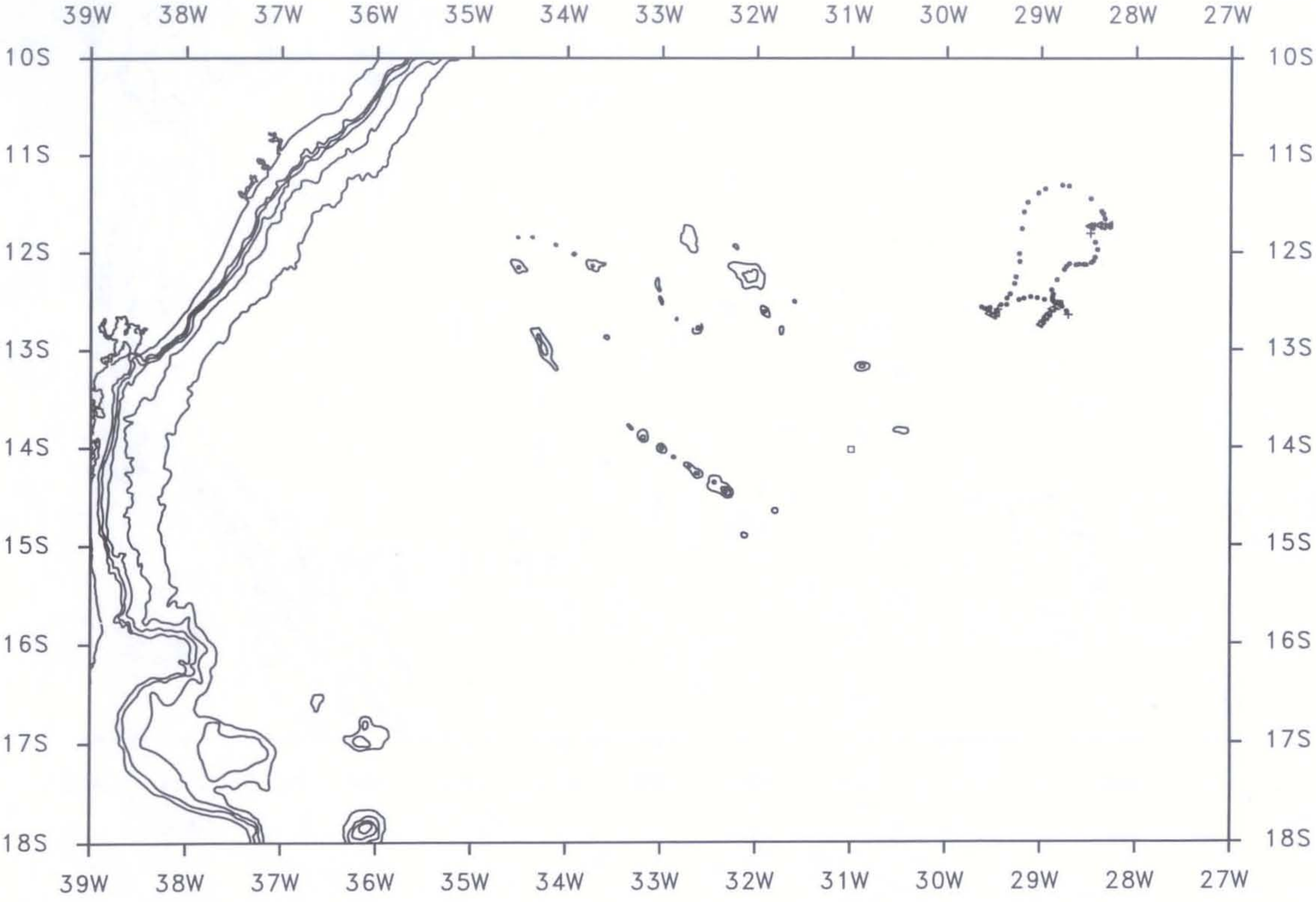
sampling interval= 24 h
number of samples= 113

average temperature= 4.29 degC

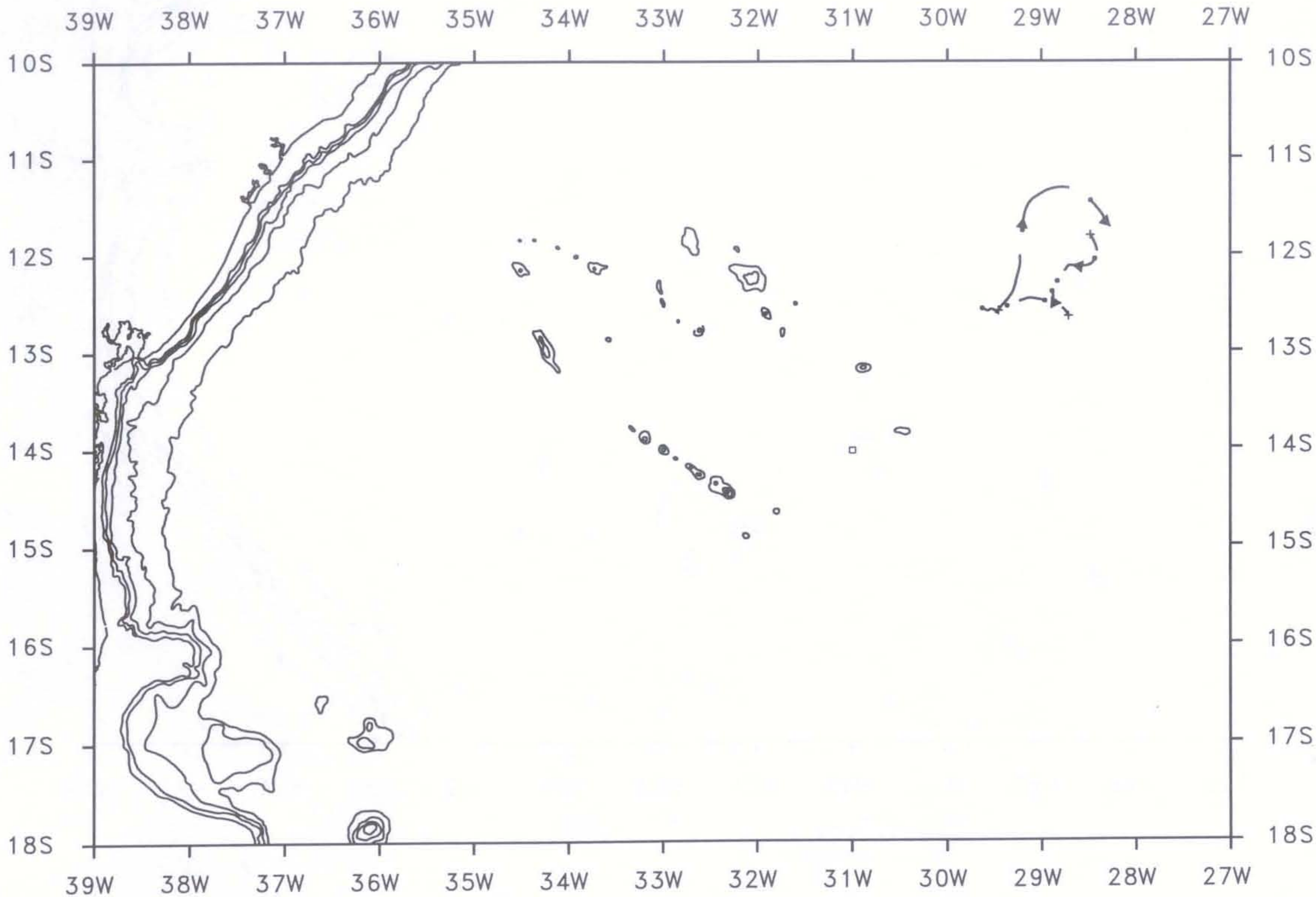
temperature variance= 0.0043 degC*degC

covar(u,temp)= 0.05 cm.degC/s
covar(v,temp)= 0.01 cm.degC/s

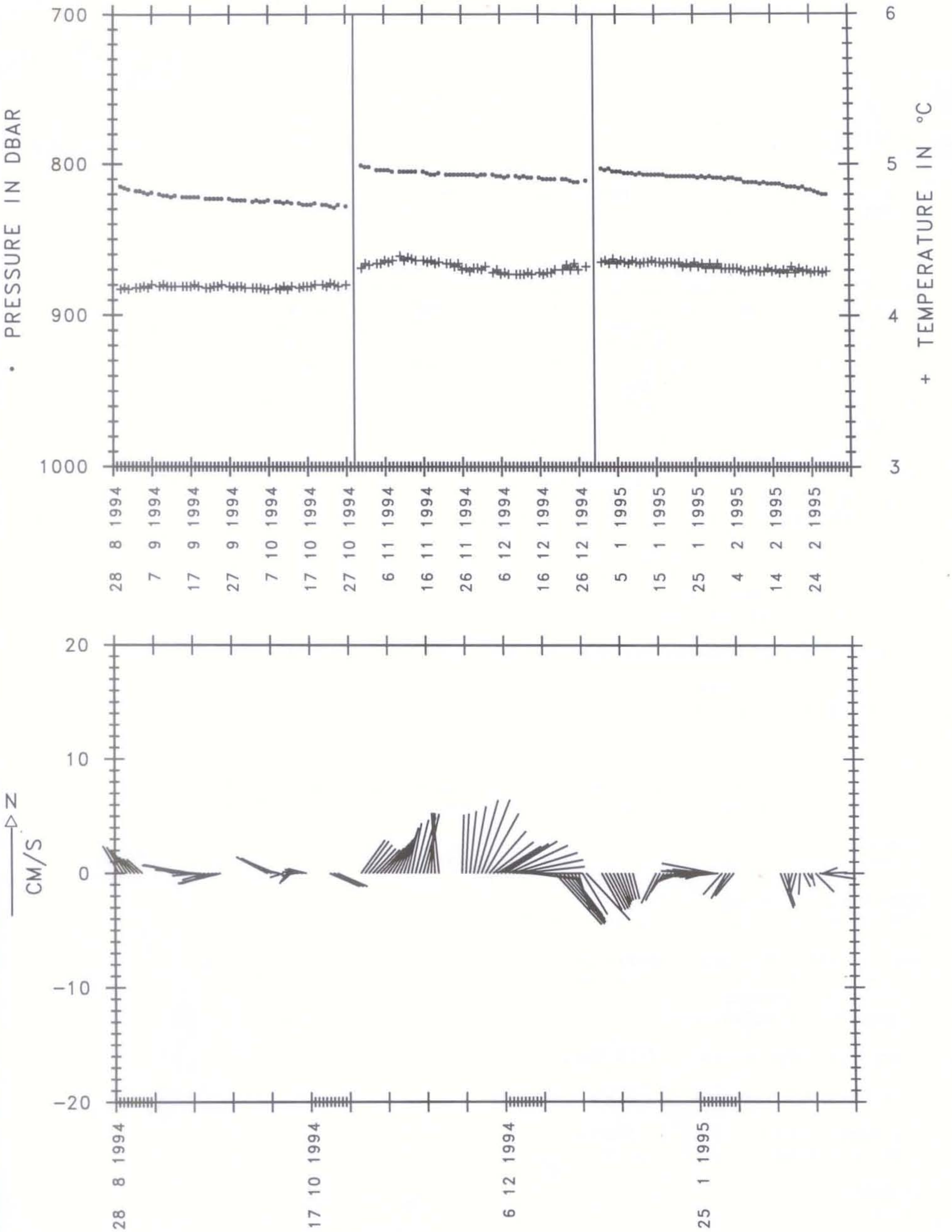
Comments:



SAMBA M119 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M119 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED



SAMBA M119 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m119
----

launch date	launch lat	launch long
1994 2 22 14h UT	14.025 S	31.000 W

file	m119-c7.fin	m119-c8.fin	m119-c9.fin
date of 1st pos	1995 3 3 (16498)	1995 5 4 (16560)	1995 7 5 (16622)
1st pos	29.038W 12.767S	27.424W 11.361S	27.656W 11.817S
last pos	27.373W 11.371S	27.423W 11.576S	28.584W 11.446S
1st P and T	820dbar 4.25degC	821dbar 4.24degC	809dbar 4.35degC
last P and T	841dbar 4.18degC	852dbar 4.20degC	842dbar 4.26degC
displacements (East and North)	181km 155km	0km -24km	-101km 41km
mean velocities (East and North)	3.55cm/s 3.04cm/s	0.00cm/s -0.47cm/s	-1.98cm/s 0.81cm/s
number of pos	60	60	60

Velocity time series statistics:
----

sampling interval= 24 h
number of samples= 180

18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.52 cm/s [-0.82, 1.86]
average north velocity comp.= 1.10 cm/s [-0.14, 2.35]

variances
variance of east velocity comp.= 7.31 cm2/s2 [2.53, 12.09]
variance of north velocity comp.= 6.31 cm2/s2 [2.19, 10.44]

covariance
covariance= 3.45 cm2/s2 [0.31, 6.59]

Eddy Kinetic Energy
EKE= 6.81 cm2/s2 [3.66, 9.97]

Temperature time series statistics:
----

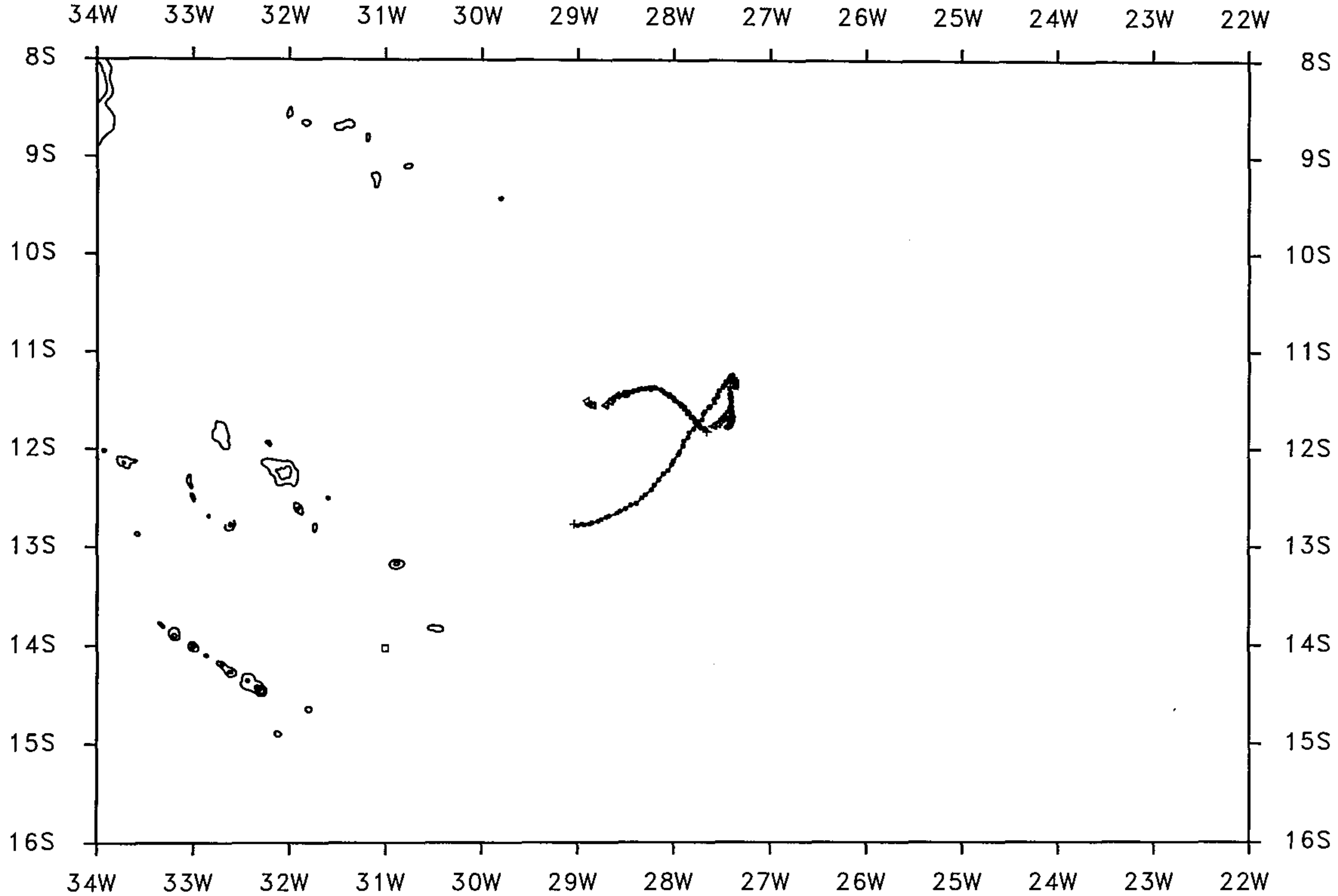
sampling interval= 24 h
number of samples= 177

average temperature= 4.26 degC

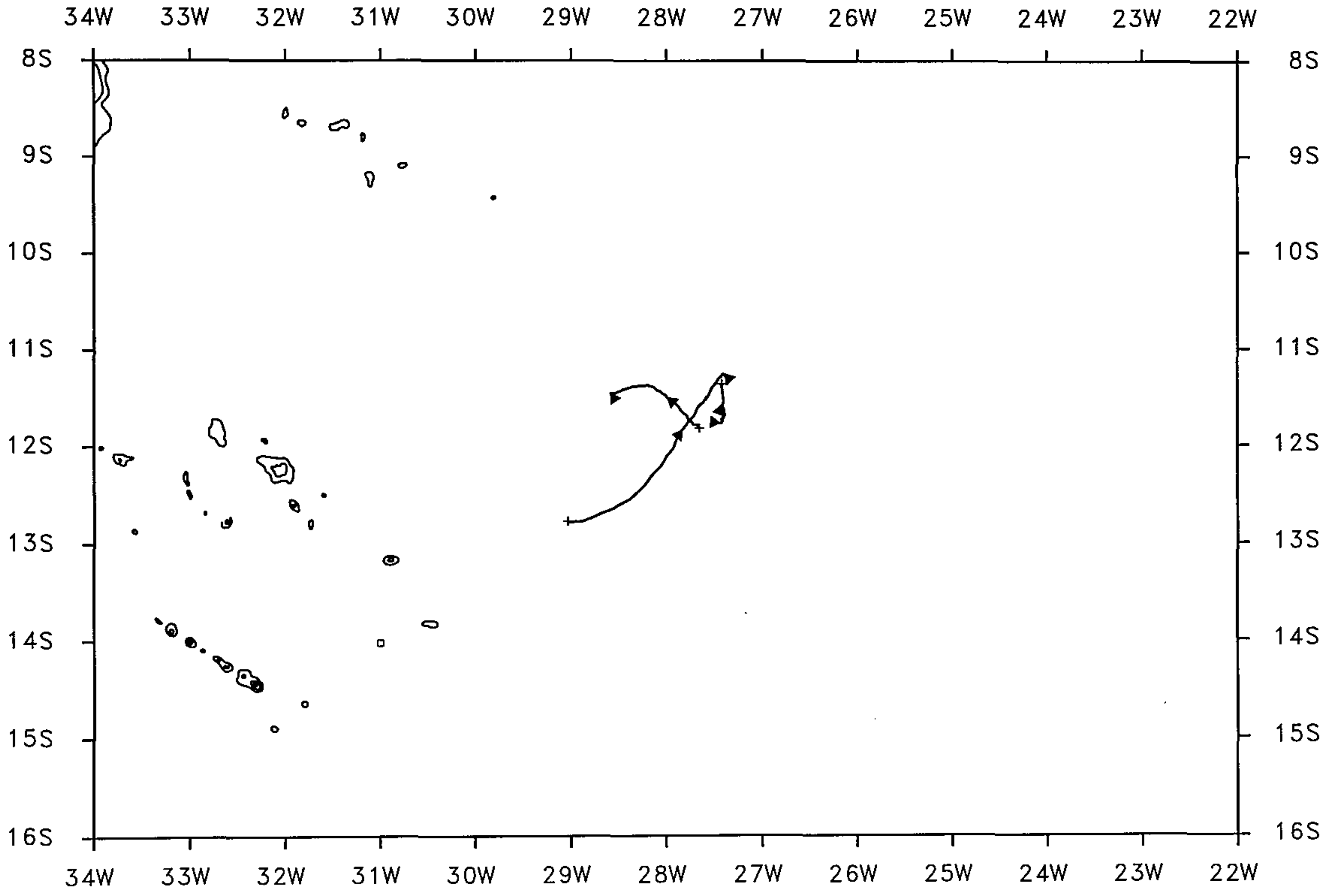
temperature variance= 0.0024 degC*degC

covar(u,temp)= -0.05 cm.degC/s
covar(v,temp)= 0.00 cm.degC/s

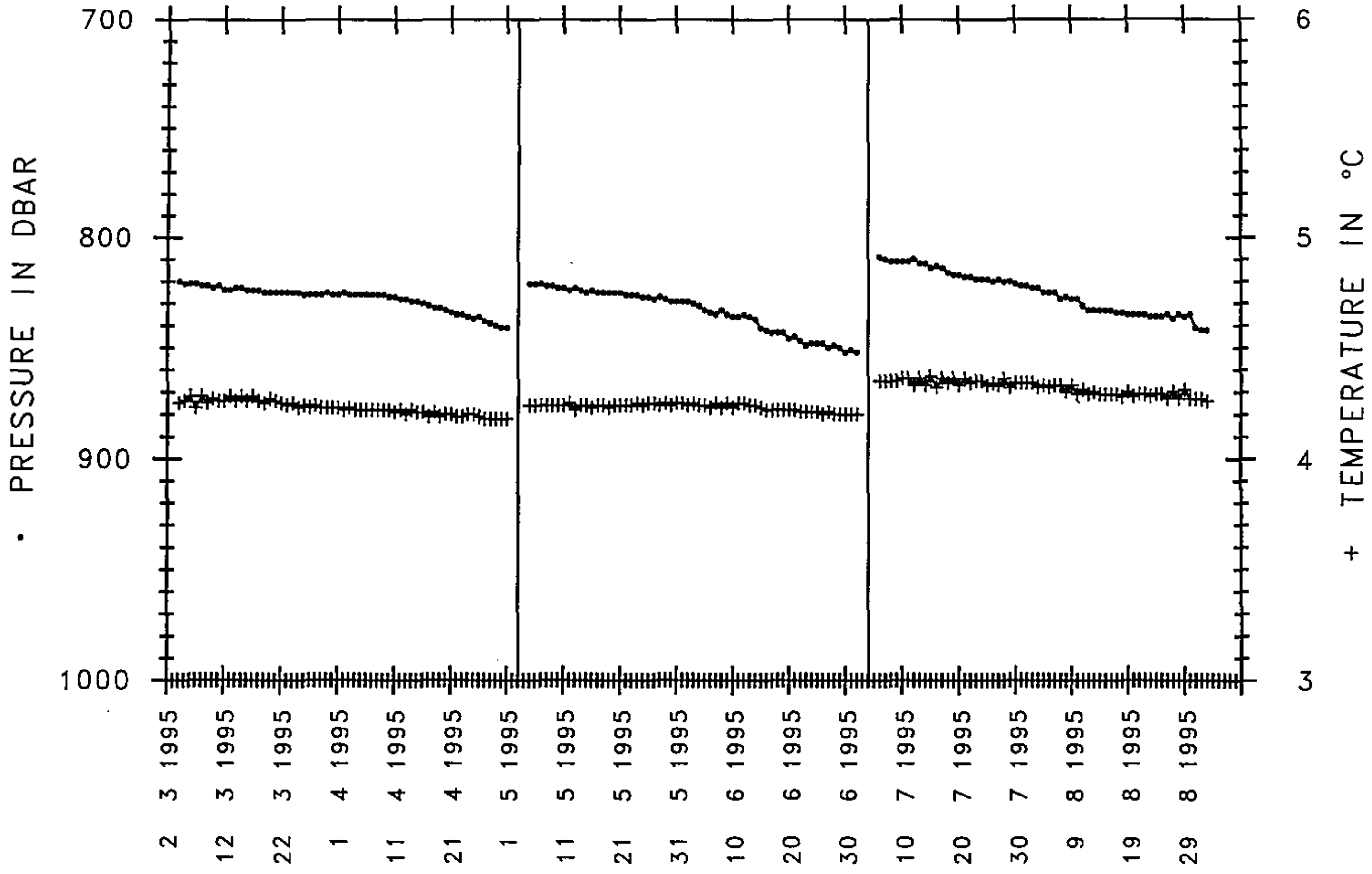
Comments:

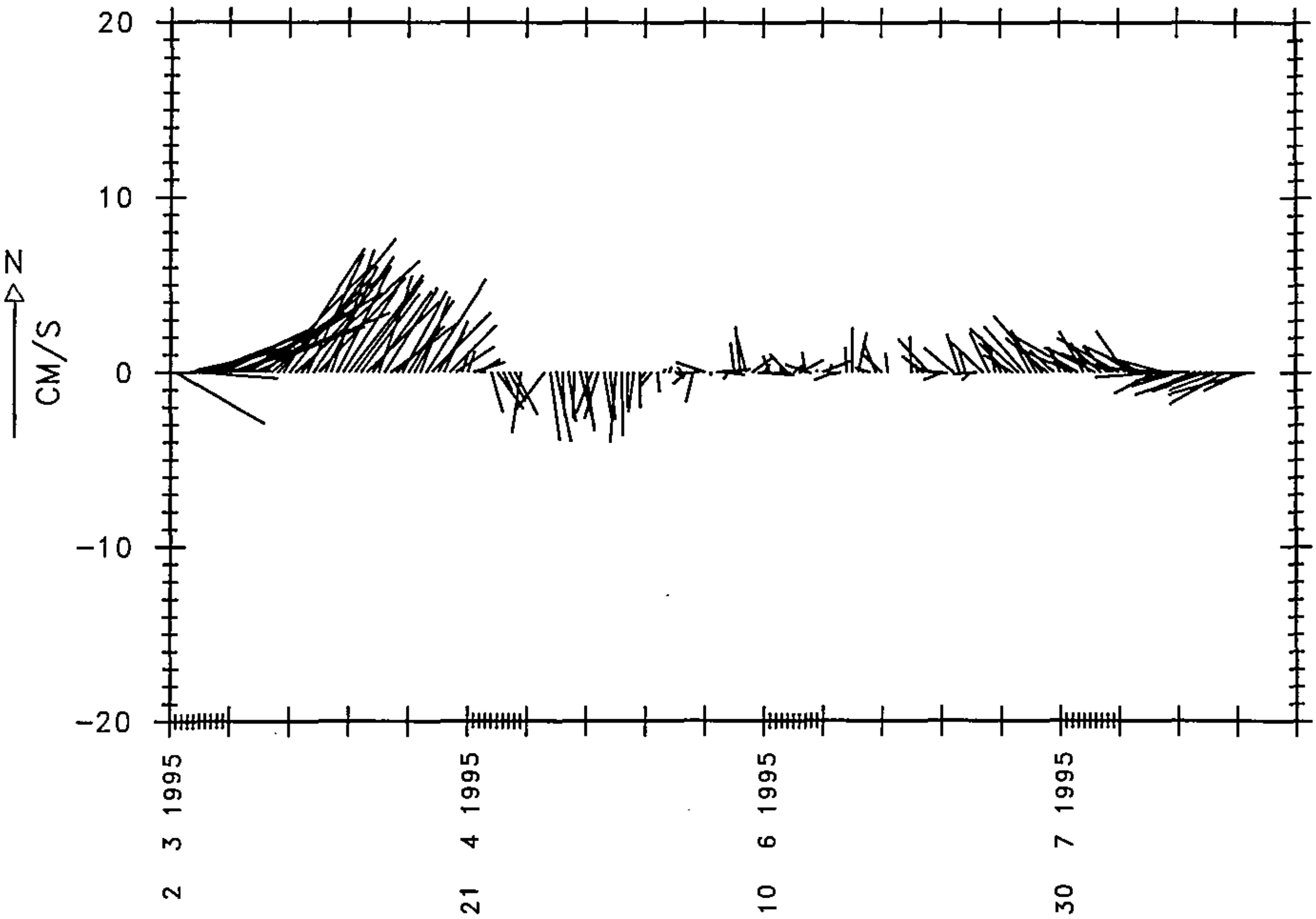


SAMBA M119 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M119 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M119 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: MARVOR #120

LAUNCHED AT: 14°15.1'S 31°13.9'W on 22/02/1994 15h59 UT

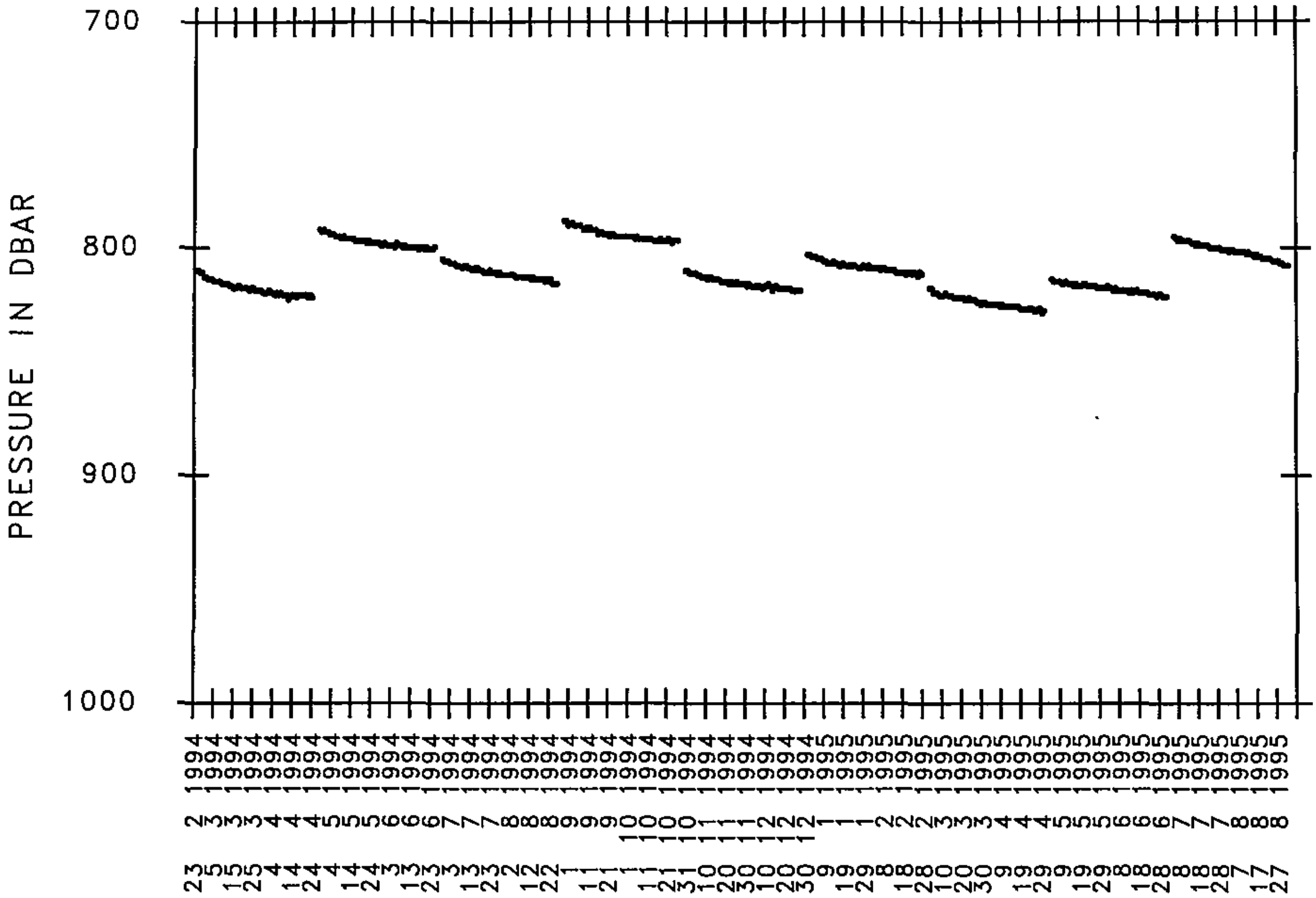
Programmed for 30 cycles (60 days at 800 ±30 dbar, and 2 days at surface for ARGOS transmission).

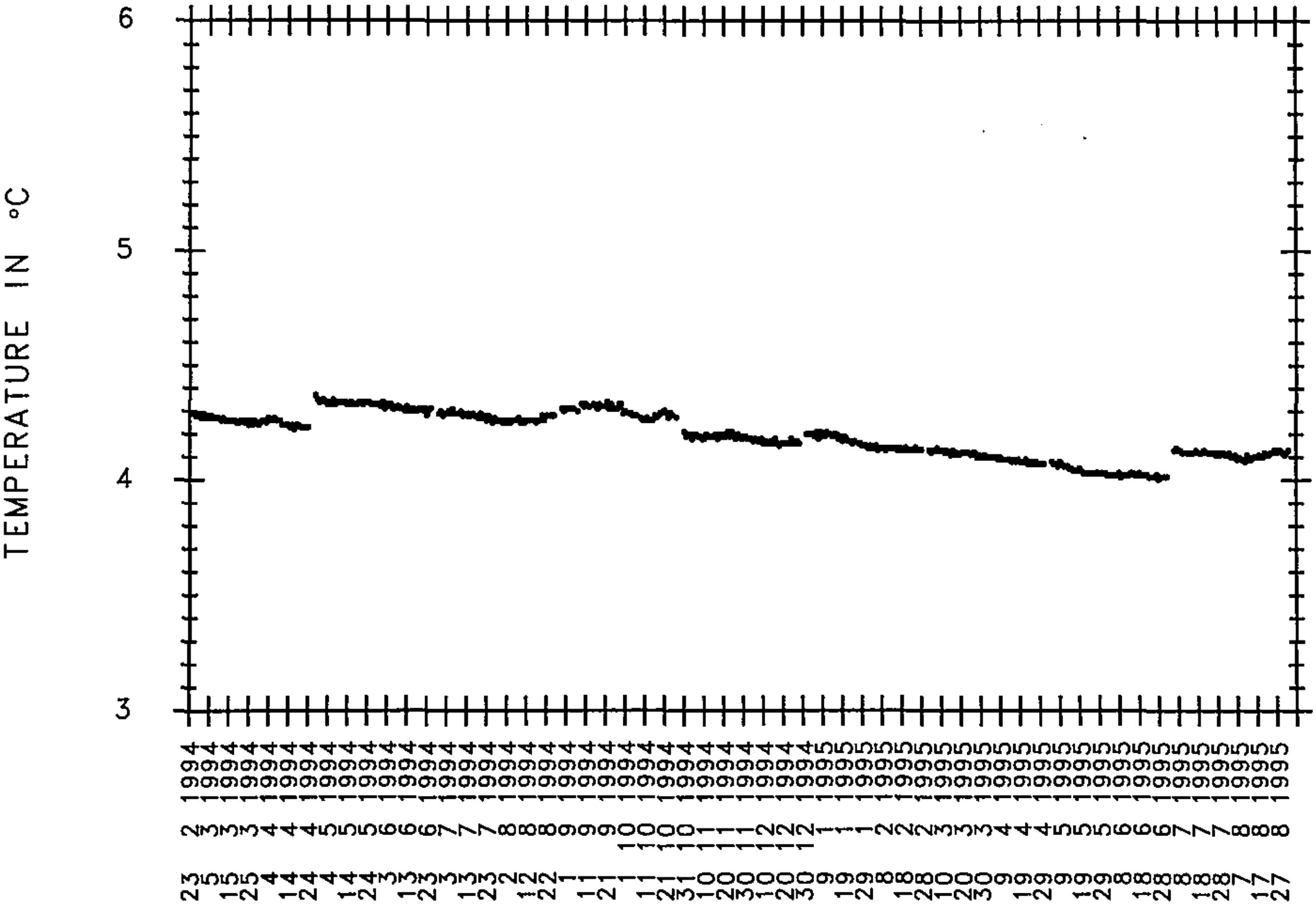
Comments

This float showed a mean southward flow, with large zonal excursions.

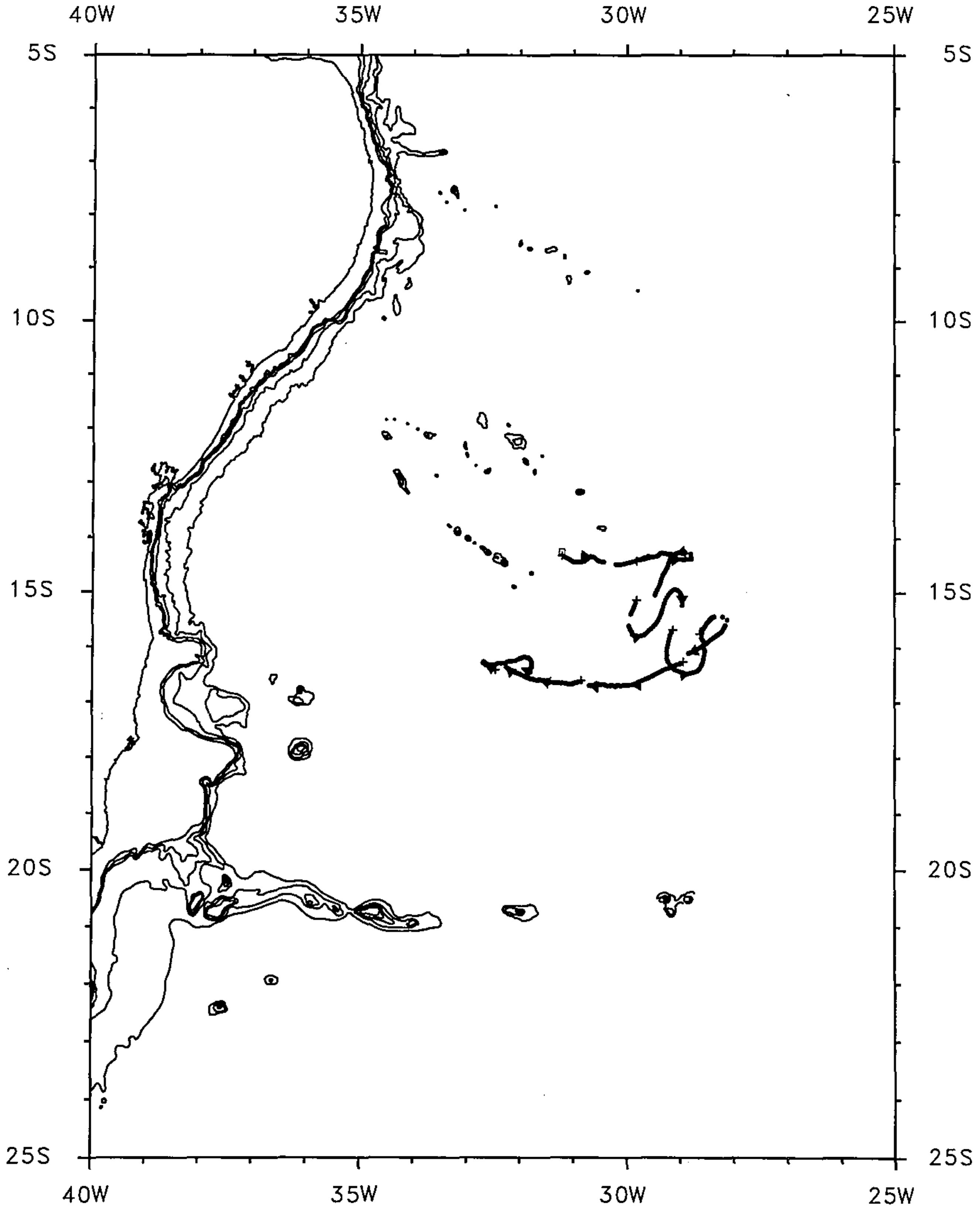
Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
m120-c1.raw	m120-c1.fin	m120-c1.diaric
m120-c2.raw	m120-c2.fin	m120-c2.diaric
m120-c3.raw	m120-c3.fin	m120-c3.diaric
m120-c4.raw	m120-c4.fin	m120-c4.diaric
m120-c5.raw	m120-c5.fin	m120-c5.diaric
m120-c6.raw	m120-c6.fin	m120-c6.diaric
m120-c7.raw	m120-c7.fin	m120-c7.diaric
m120-c8.raw	m120-c8.fin	m120-c8.diaric
m120-c9.raw	m120-c9.fin	m120-c9.diaric





SAMBA M120 CYCLES 1 TO 9



SAMBA M120 (FEBRUARY 1994 - AUGUST 1995)

EXPERIMENT: SAMBA

FLOAT: m120

launch date	launch lat	launch long
1994 2 22 16h UT	14.252 S	31.232 W

file	m120-c1.fin	m120-c2.fin	m120-c3.fin
date of 1st pos	1994 2 26 (16128)	1994 4 27 (16188)	1994 6 28 (16250)
1st pos	31.226W 14.321S	29.826W 14.427S	28.915W 14.275S
last pos	29.615W 14.336S	28.819W 14.289S	29.481W 15.049S
1st P and T	810dbar 4.29degC	792dbar 4.37degC	805dbar 4.29degC
last P and T	822dbar 4.23degC	800dbar 4.31degC	816dbar 4.28degC
displacements (East and North)	173km -2km	108km 15km	-61km -86km
mean velocities (East and North)	3.58cm/s -0.03cm/s	2.16cm/s 0.31cm/s	-1.21cm/s -1.72cm/s
number of pos	52	59	59

Velocity time series statistics:

sampling interval= 24 h
number of samples= 170

17 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 1.41 cm/s [0.09, 2.73]
average north velocity comp.= -0.46 cm/s [-1.45, 0.53]

variances
variance of east velocity comp.= 6.65 cm2/s2 [2.18, 11.12]
variance of north velocity comp.= 3.76 cm2/s2 [1.23, 6.28]

covariance
covariance= 2.51 cm2/s2 [0.14, 4.89]

Eddy Kinetic Energy
EKE= 5.20 cm2/s2 [2.64, 7.77]

Temperature time series statistics:

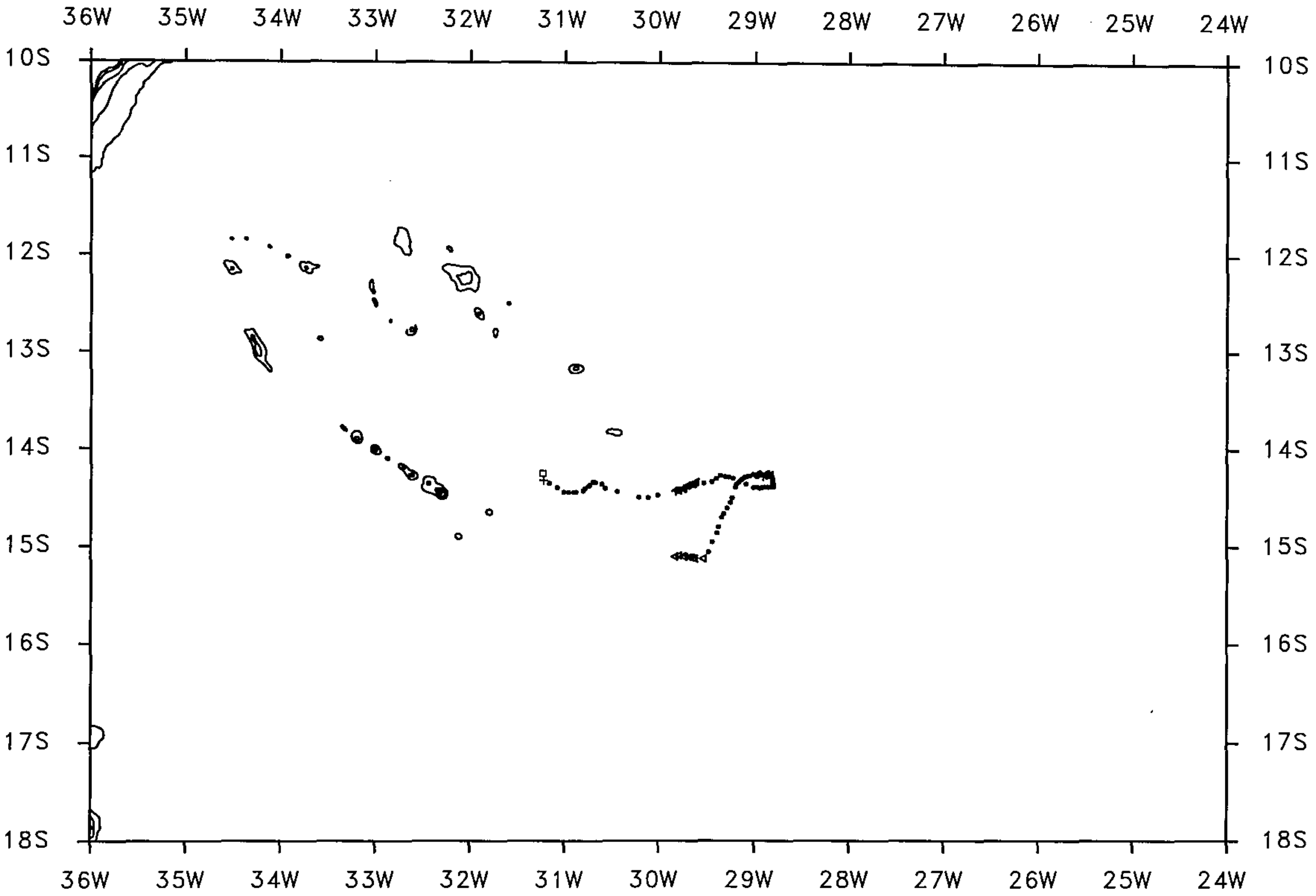
sampling interval= 24 h
number of samples= 166

average temperature= 4.29 degC

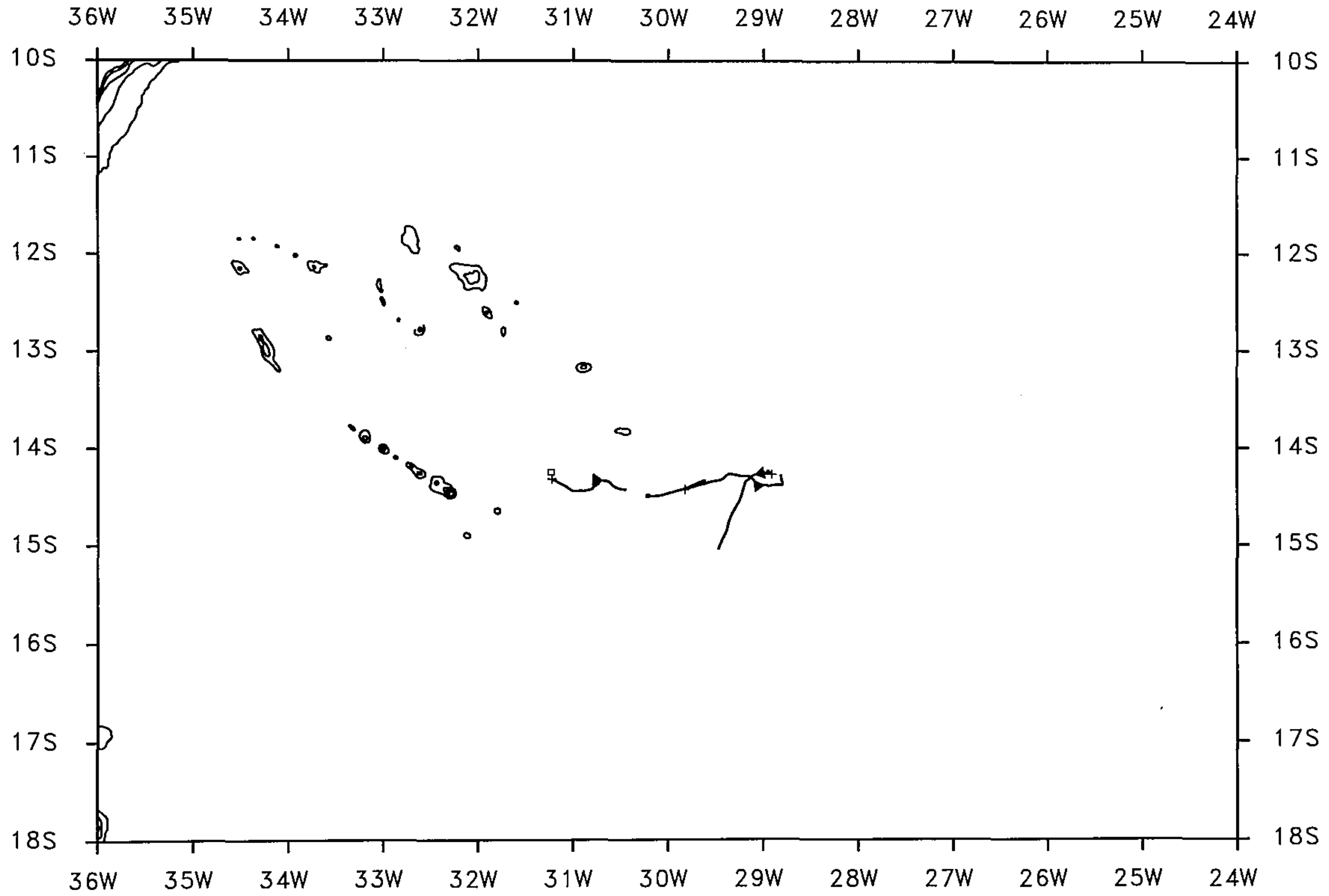
temperature variance= 0.0012 degC*degC

covar(u,temp)= 0.01 cm.degC/s
covar(v,temp)= 0.01 cm.degC/s

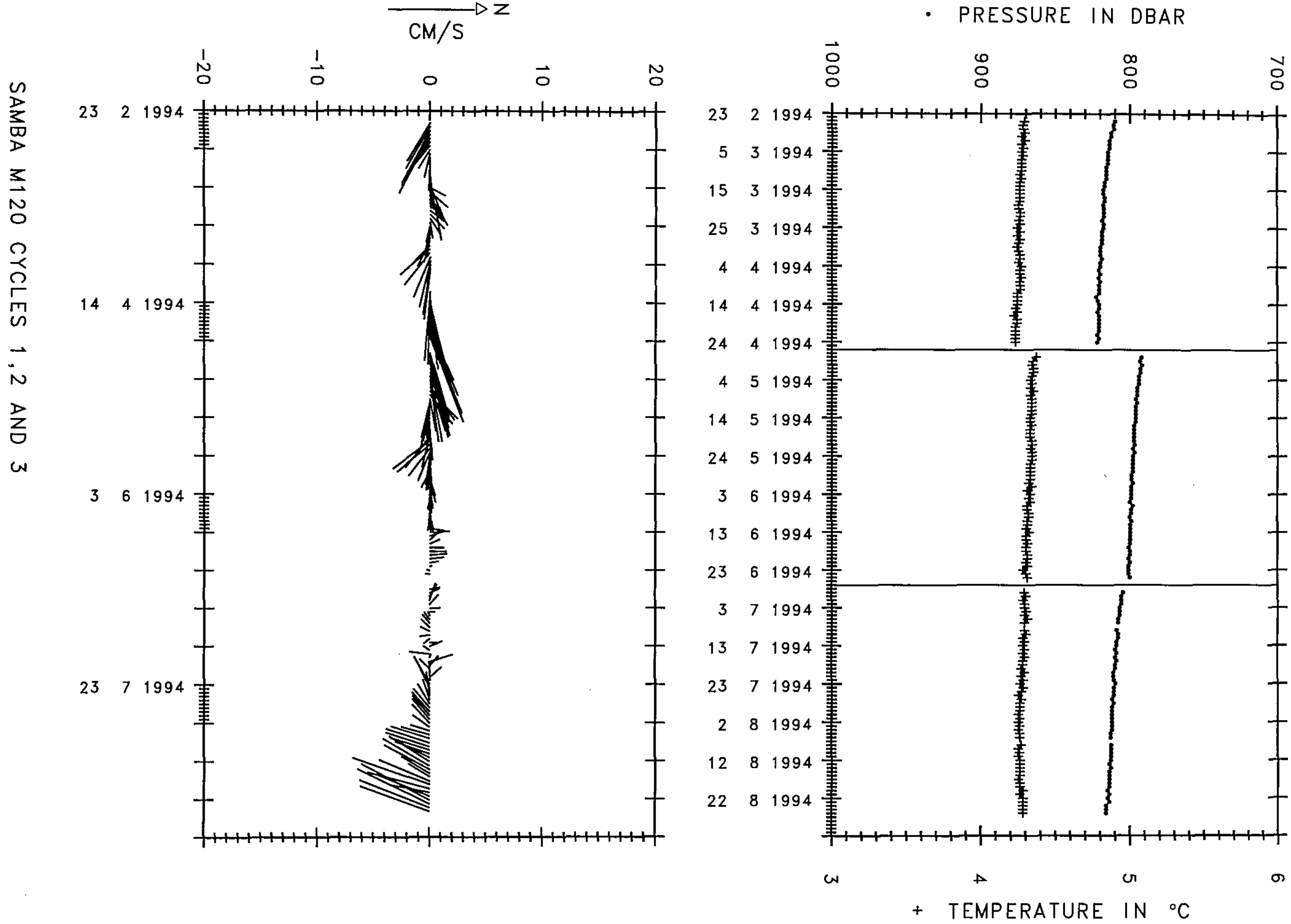
Comments:



SAMBA M120 CYCLES 1,2 AND 3 RAW POSITIONS



SAMBA M120 CYCLES 1,2 AND 3 LANCZOS FILTERED AND SPLINED


SAMBA M120 CYCLES 1,2 AND 3
N
CM/S
-20
-10
0
10
20
23 2 1994
14 4 1994
3 6 1994
23 7 1994
• PRESSURE IN DBAR
1000
900
800
700
23 2 1994
5 3 1994
15 3 1994
25 3 1994
4 4 1994
14 4 1994
24 4 1994
4 5 1994
14 5 1994
24 5 1994
3 6 1994
13 6 1994
23 6 1994
3 7 1994
13 7 1994
23 7 1994
2 8 1994
12 8 1994
22 8 1994
3
4
5
6
+ TEMPERATURE IN °C

EXPERIMENT: SAMBA

FLOAT: m120

launch date	launch lat	launch long
1994 2 22 16h UT	14.252 S	31.232 W

file	m120-c4.fin	m120-c5.fin	m120-c6.fin
date of 1st pos	1994 8 29 (16312)	1994 10 30 (16374)	1994 12 31 (16436)
1st pos	29.824W 15.134S	29.151W 15.684S	28.646W 15.751S
last pos	28.971W 15.235S	28.615W 15.671S	28.859W 16.107S
1st P and T	788dbar 4.31degC	810dbar 4.21degC	803dbar 4.20degC
last P and T	797dbar 4.27degC	819dbar 4.16degC	812dbar 4.13degC
displacements (East and North)	91km -11km	57km 1km	-23km -40km
mean velocities (East and North)	1.79cm/s -0.22cm/s	1.14cm/s 0.03cm/s	-0.45cm/s -0.78cm/s
number of pos	55	59	43

Velocity time series statistics:

sampling interval= 24 h
number of samples= 155

16 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
average east velocity comp.= 0.78 cm/s [-0.67, 2.23]
average north velocity comp.= -0.14 cm/s [-2.22, 1.94]

variances
variance of east velocity comp.= 7.48 cm2/s2 [2.30, 12.66]
variance of north velocity comp.= 15.44 cm2/s2 [4.74, 26.14]

covariance
covariance= 4.92 cm2/s2 [-0.34, 10.18]

Eddy Kinetic Energy
EKE= 11.46 cm2/s2 [5.51, 17.40]

Temperature time series statistics:

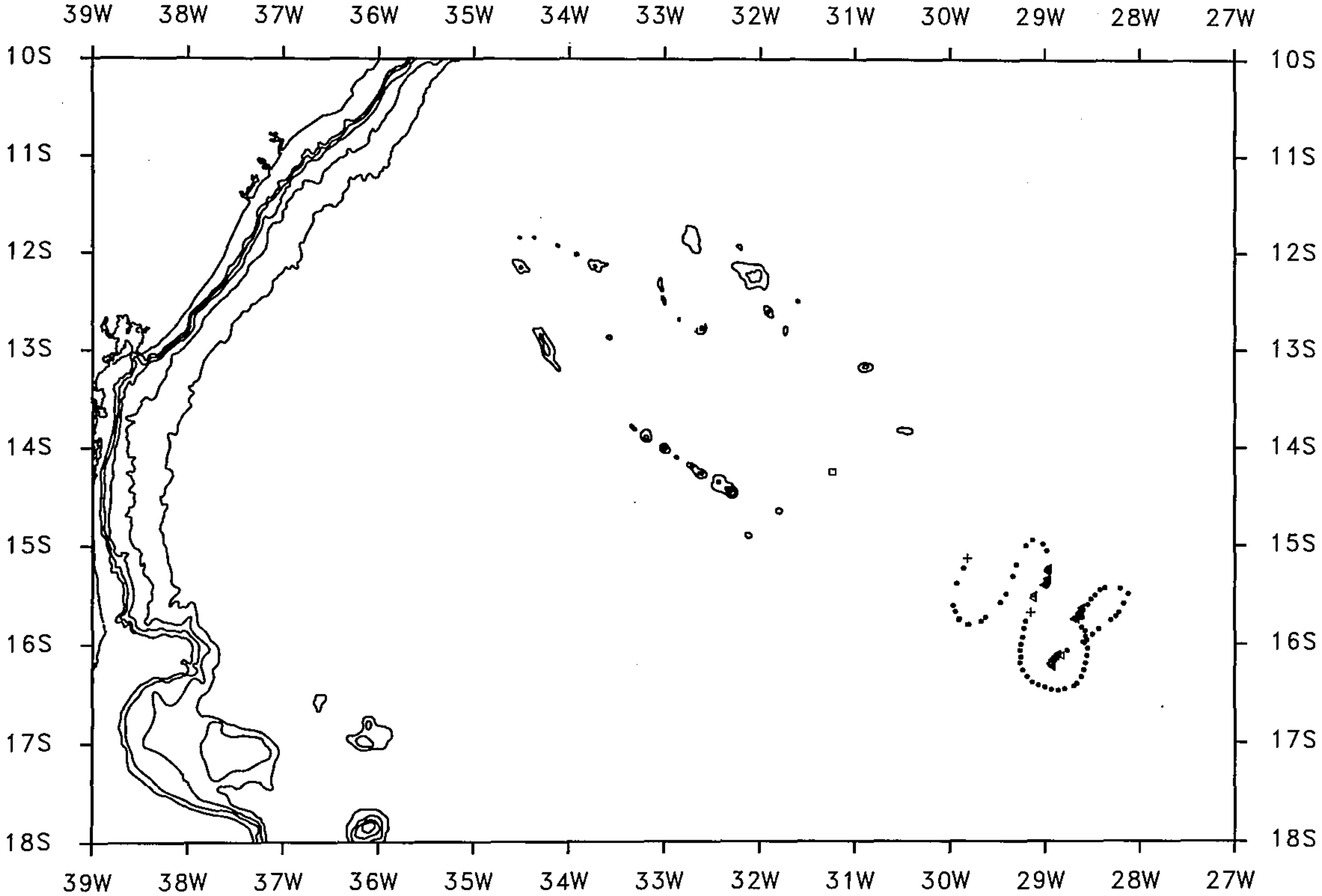
sampling interval= 24 h
number of samples= 143

average temperature= 4.21 degC

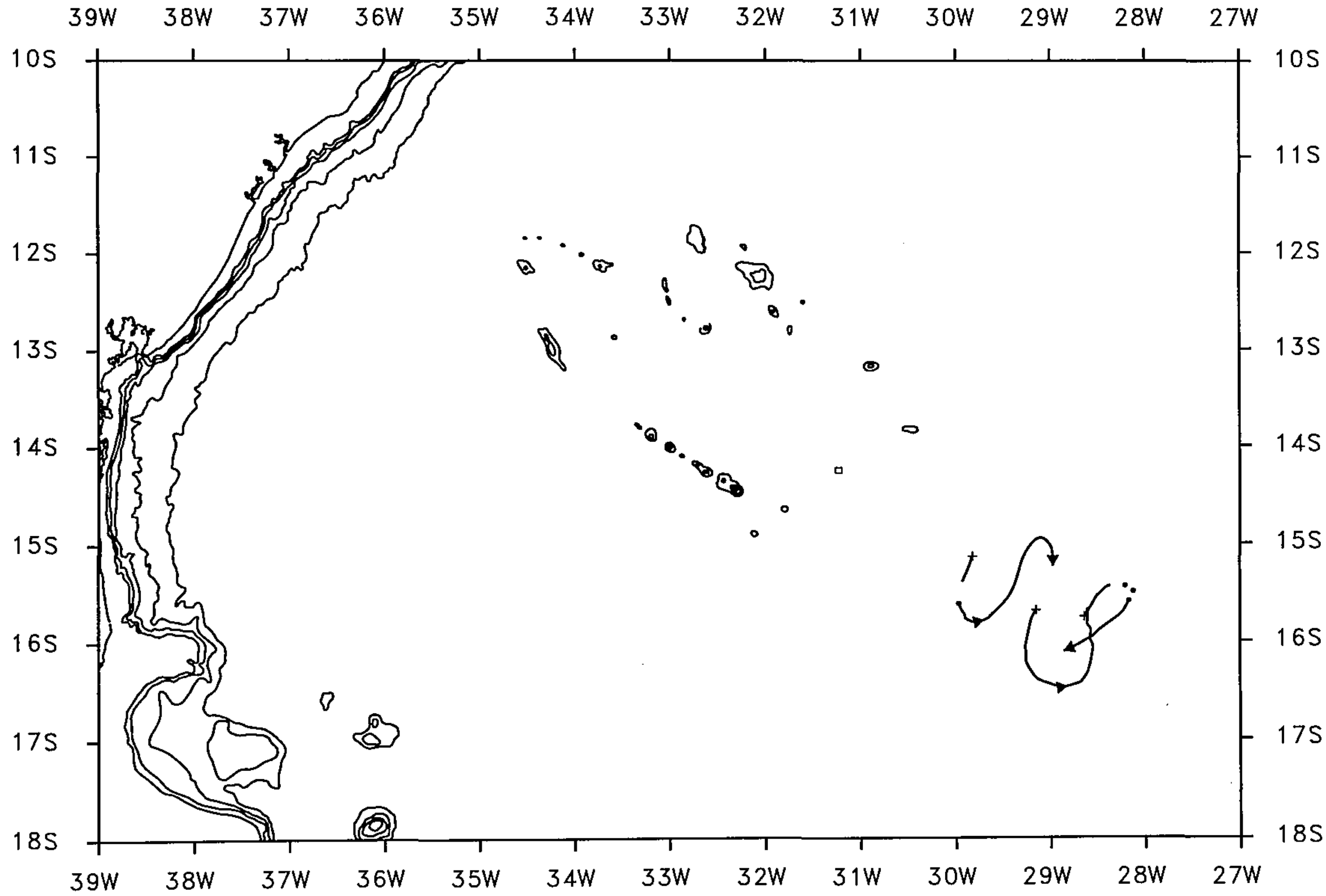
temperature variance= 0.0041 degC*degC

covar(u,temp)= 0.08 cm.degC/s
covar(v,temp)= 0.01 cm.degC/s

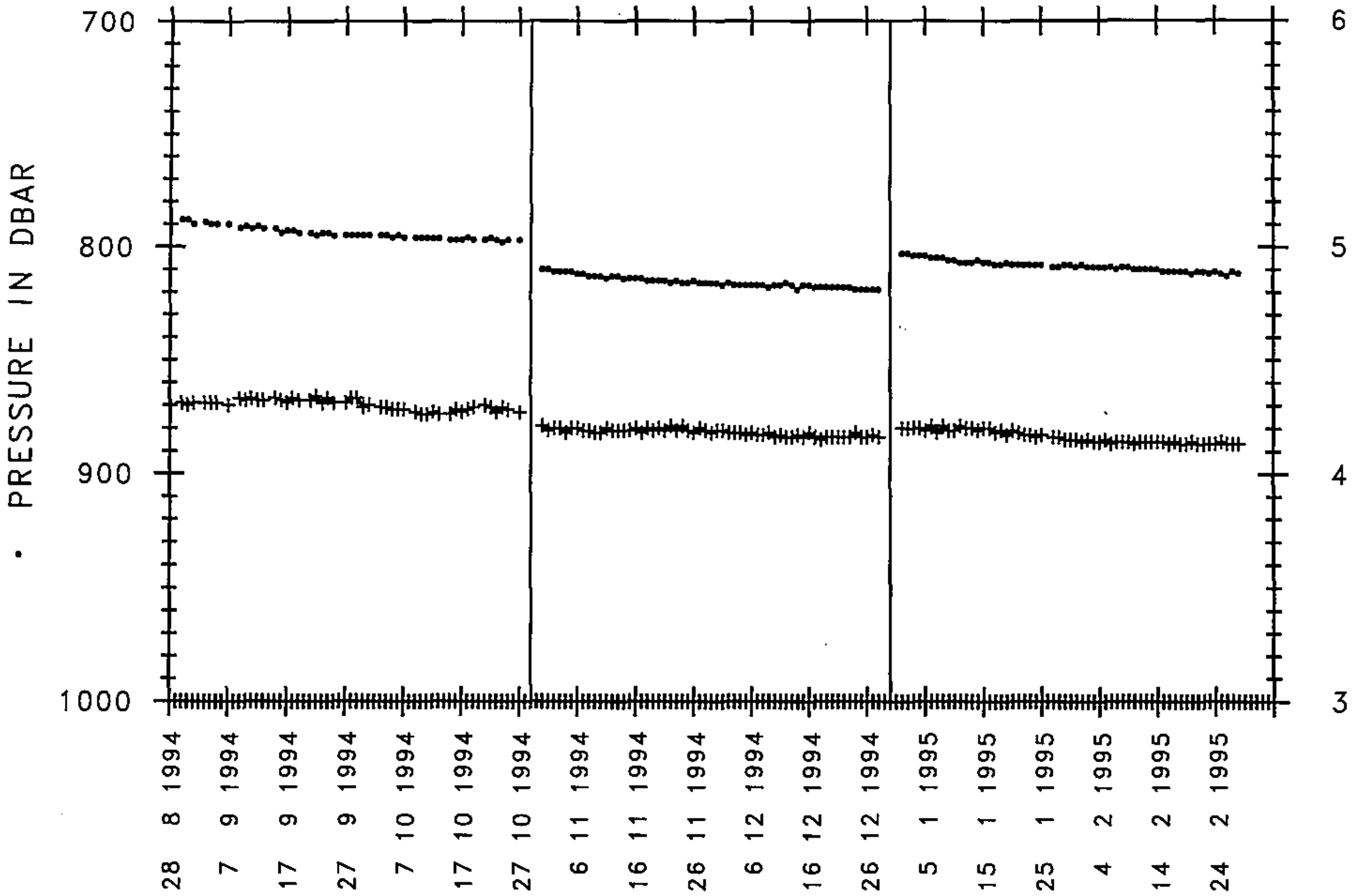
Comments:

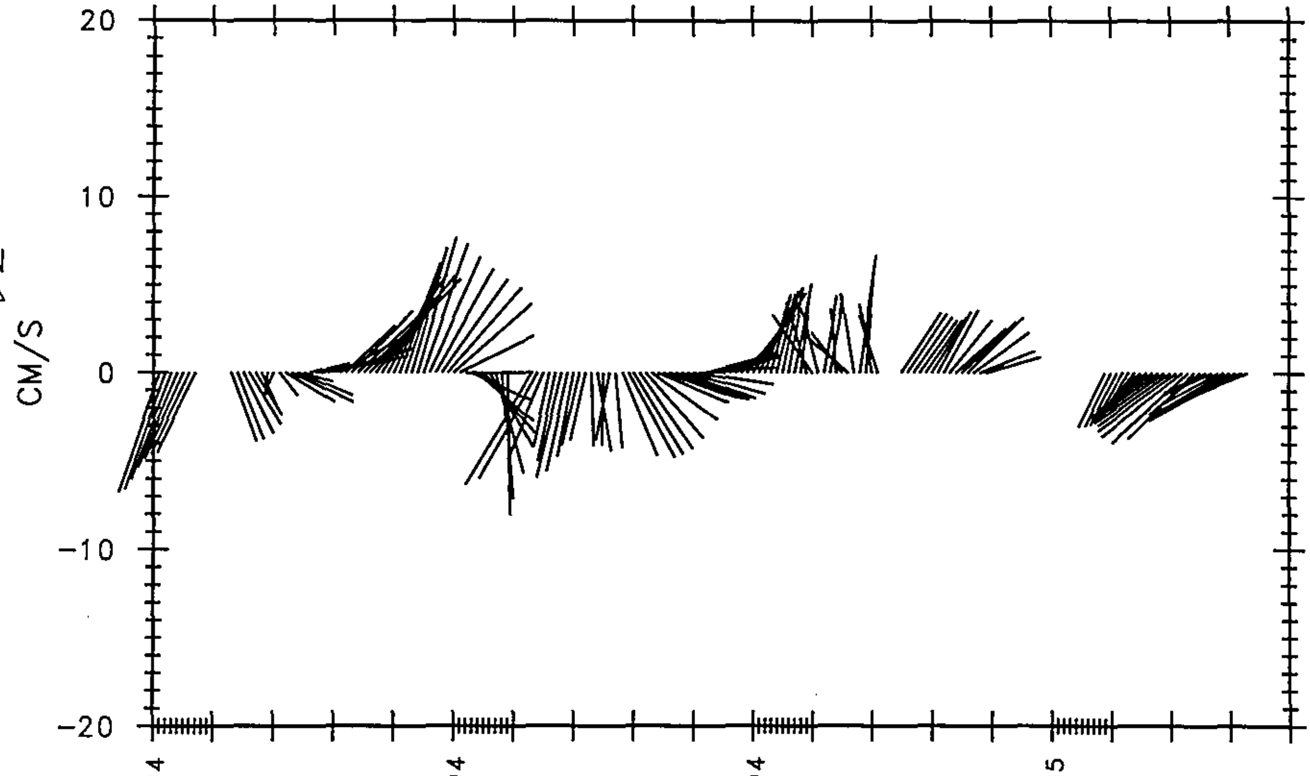


SAMBA M120 CYCLES 4,5 AND 6 RAW POSITIONS



SAMBA M120 CYCLES 4,5 AND 6 LANCZOS FILTERED AND SPLINED





SAMBA M120 CYCLES 4,5 AND 6

EXPERIMENT: SAMBA

FLOAT: m120

```
  launch date              launch lat    launch long
 1994  2 22 16h UT          14.252 S      31.232 W
```

file	m120-c7.fin	m120-c8.fin	m120-c9.fin
date of 1st pos	1995 3 3 (16498)	1995 5 4 (16560)	1995 7 5 (16622)
1st pos	28.953W 16.262S	30.862W 16.603S	32.463W 16.412S
last pos	30.712W 16.697S	32.267W 16.360S	31.857W 16.542S
1st P and T	818dbar 4.13degC	814dbar 4.08degC	795dbar 4.13degC
last P and T	828dbar 4.07degC	822dbar 4.01degC	808dbar 4.13degC
displacements (East and North)	-187km -48km	-150km 27km	65km -14km
mean velocities (East and North)	-3.68cm/s -0.95cm/s	-2.94cm/s 0.53cm/s	1.27cm/s -0.28cm/s
number of pos	60	60	60

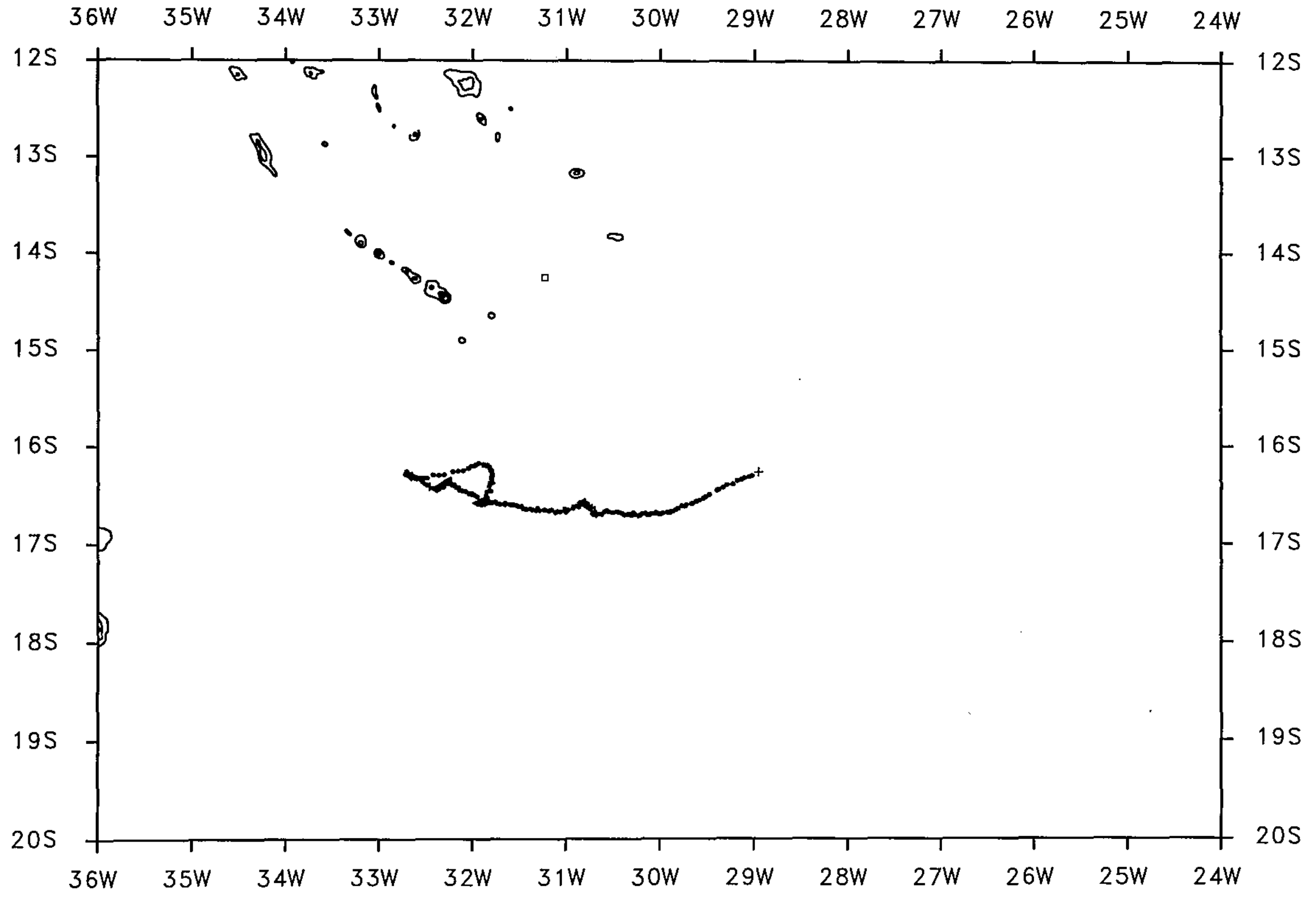
Velocity time series statistics:

```
  sampling interval= 24 h
  number of samples=  180

   18 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
  average east velocity comp.=  -1.79 cm/s  [ -3.26, -0.33]
  average north velocity comp.=  -0.24 cm/s  [ -1.09,  0.62]

variances
  variance of east velocity comp.=    8.74 cm2/s2  [   3.03,  14.46]
  variance of north velocity comp.=   3.00 cm2/s2  [   1.04,   4.95]

covariance
  covariance=   0.39 cm2/s2  [  -1.98,    2.75]

Eddy Kinetic Energy
  EKE=   5.87 cm2/s2  [   2.85,    8.89]
```

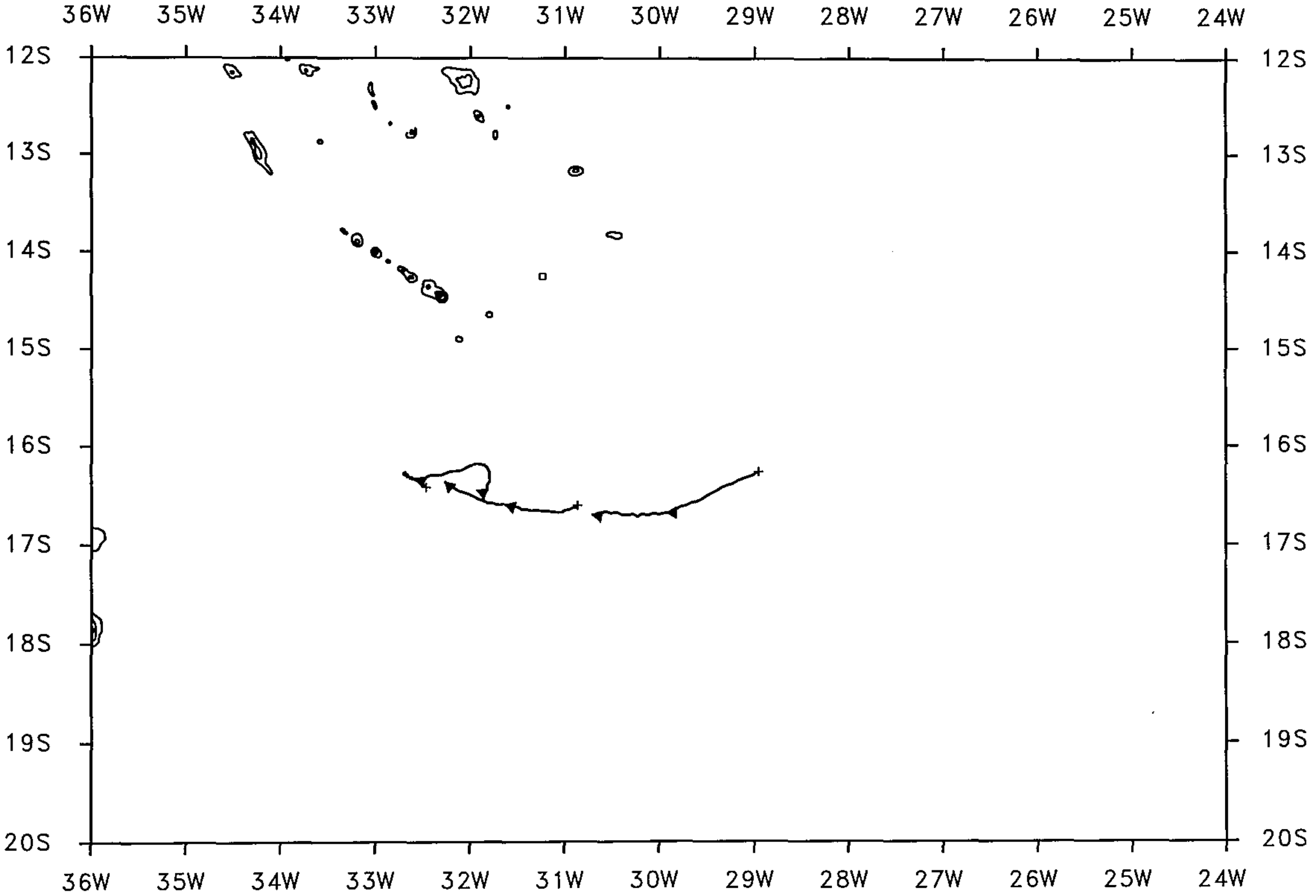
Temperature time series statistics:

```
  sampling interval= 24 h
  number of samples=  177

  average temperature=   4.08 degC

  temperature variance=    0.0017 degC*degC

  covar(u,temp)=   0.03 cm.degC/s
  covar(v,temp)=  -0.03 cm.degC/s
```

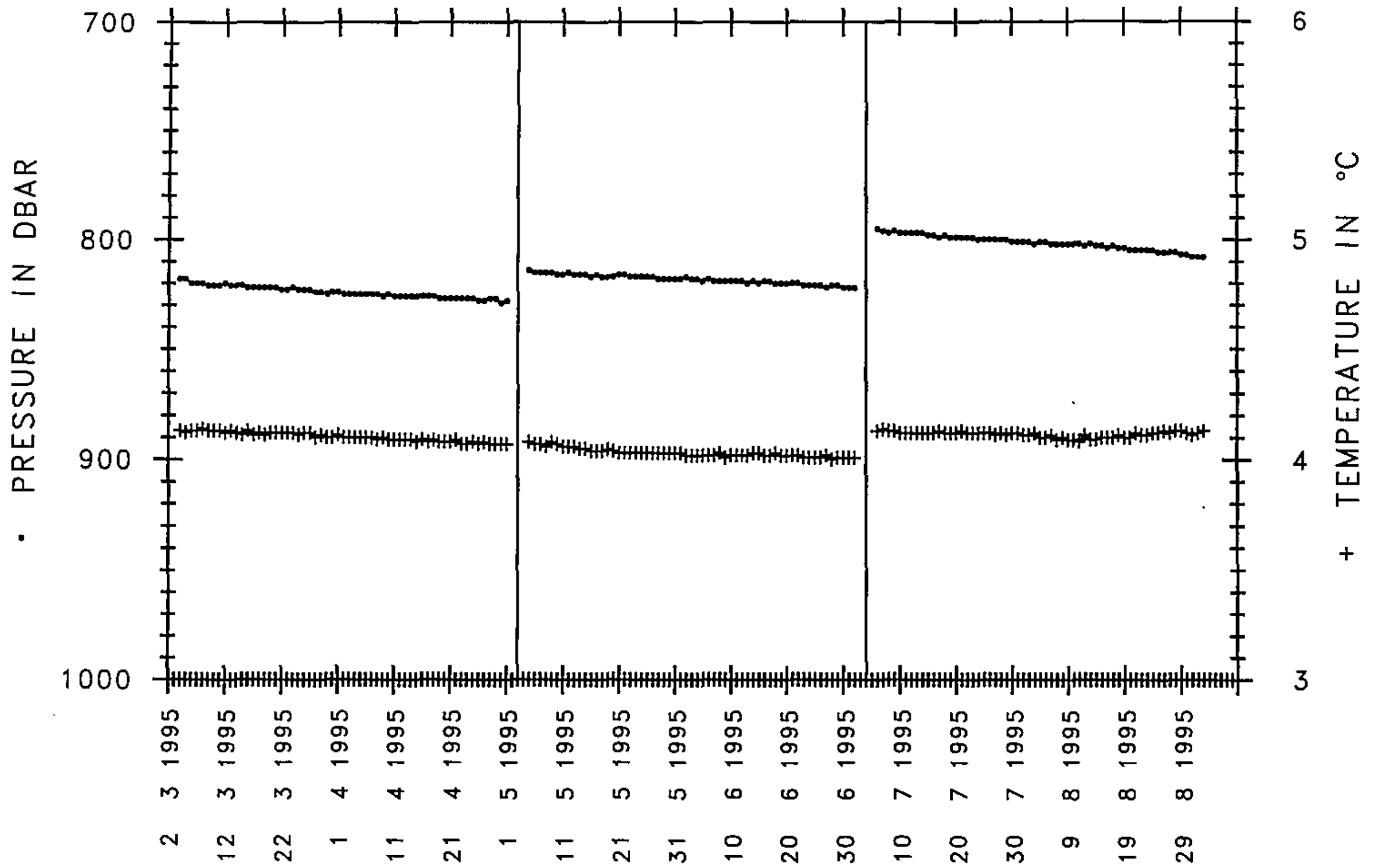
Comments:

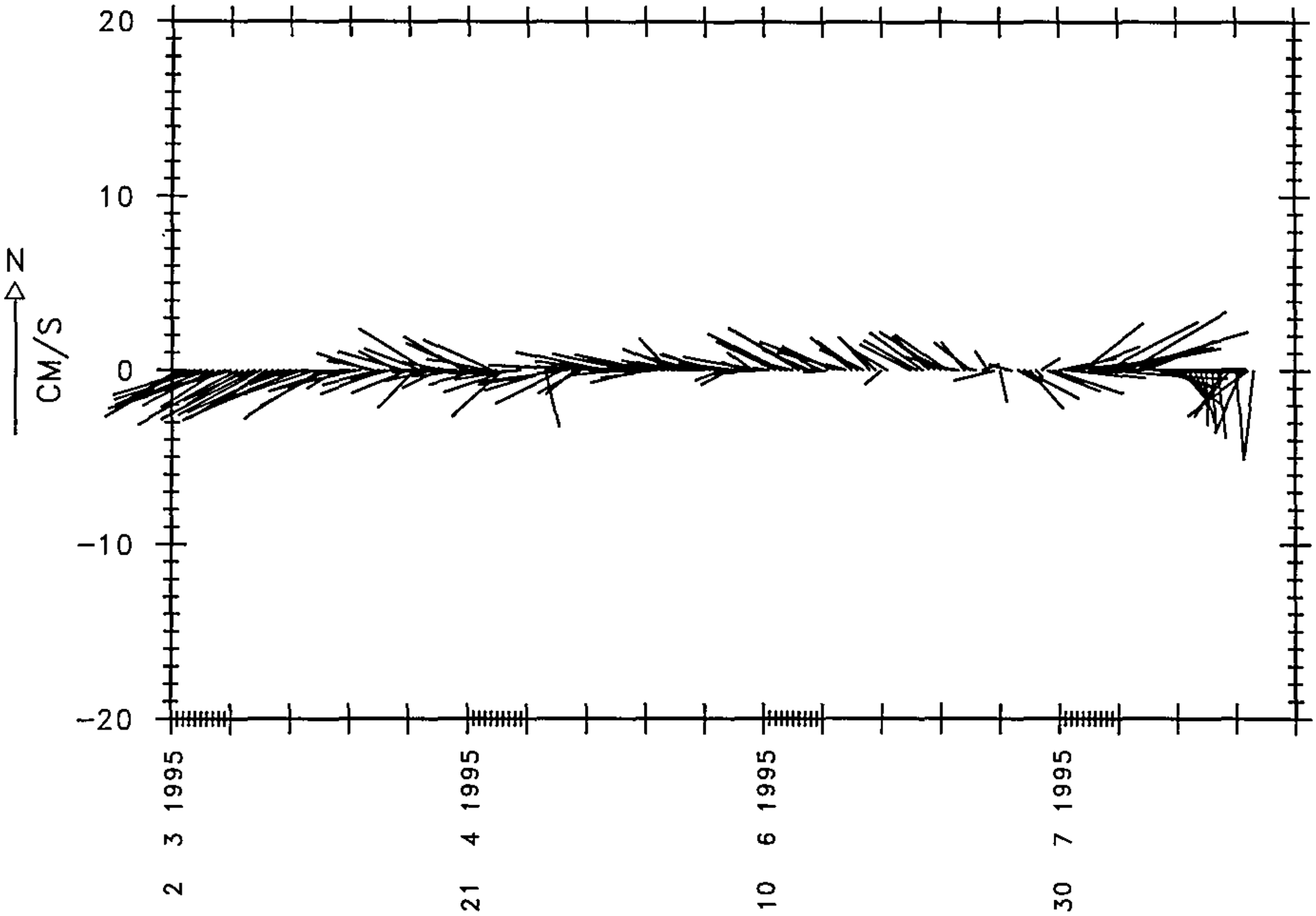


SAMBA M120 CYCLES 7,8 AND 9 RAW POSITIONS



SAMBA M120 CYCLES 7,8 AND 9 LANCZOS FILTERED AND SPLINED





SAMBA M120 CYCLES 7,8 AND 9

EXPERIMENT: SAMBA
FLOAT: VCM #19

LAUNCHED AT: 13°12.3'S 37°55.5'W on 24/02/1994 11h04 UT

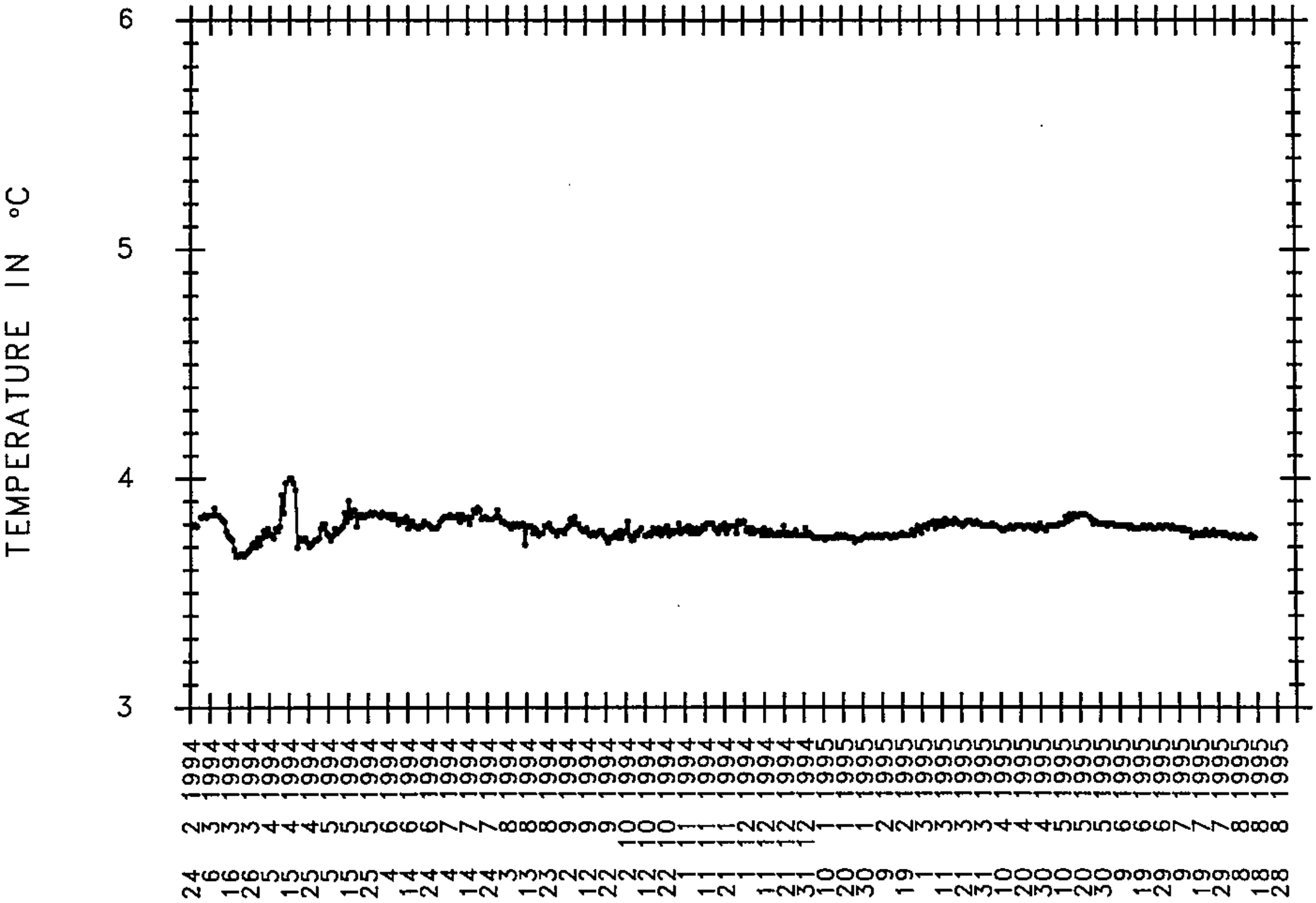
Ballasted at atmospheric pressure for 800 dbar approximately, and programmed for 548 days at depth, with pressure and temperature sampled at 0h, 8h and 16h UT.

Comments

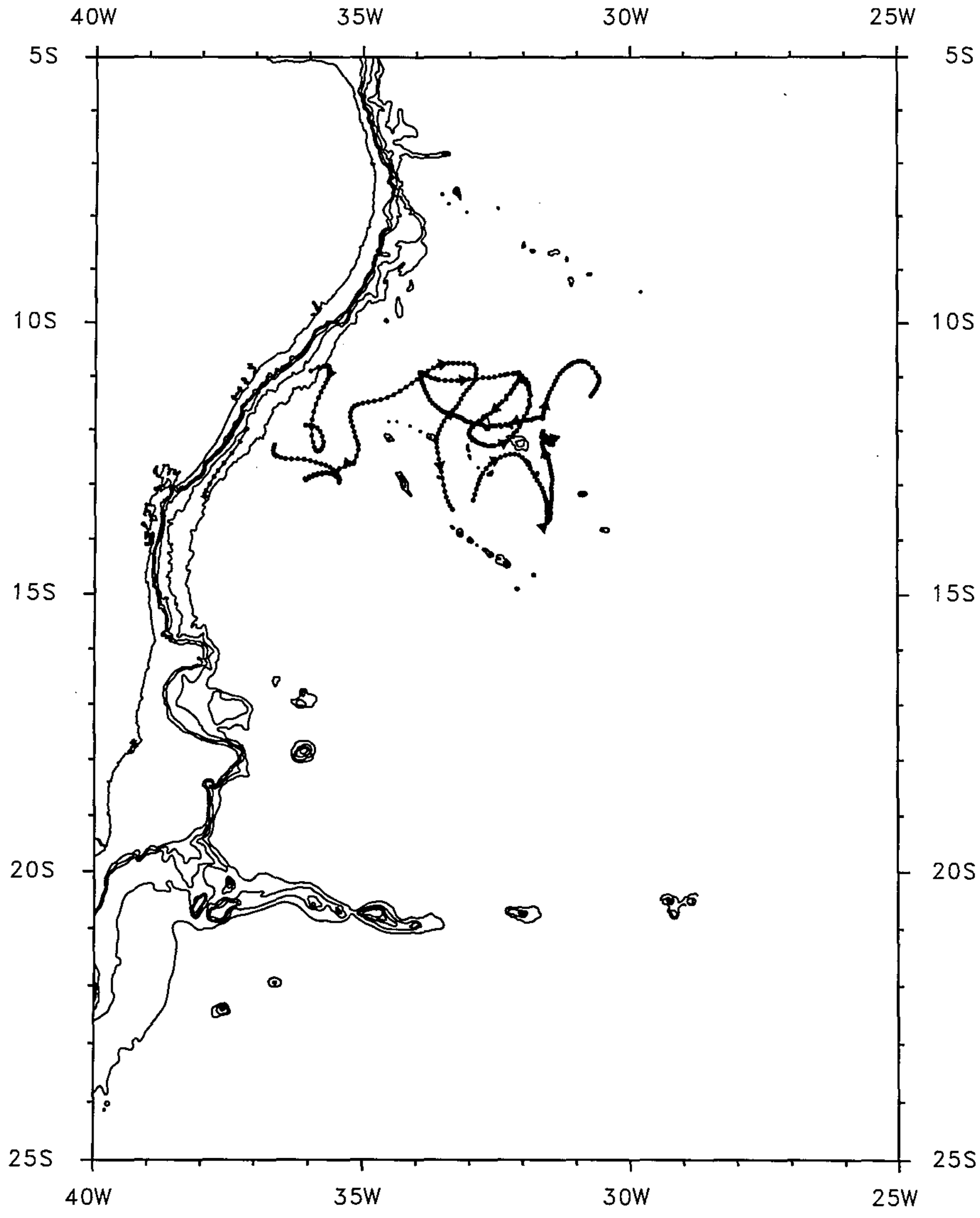
This float was launched deliberatly in the IWBC. It was detrained from the IWBC after 1 month and wandered then rather zonally.
The vertical displacement and vertical velocity estimated by this "Vertical Current Measuring" float do not seem realistic.
Since the float sank from 900 dbar to 1000 dbar over its 1.5 year life, we cannot be sure that it tagged AAIW (in particular at the end of its life).

Data files

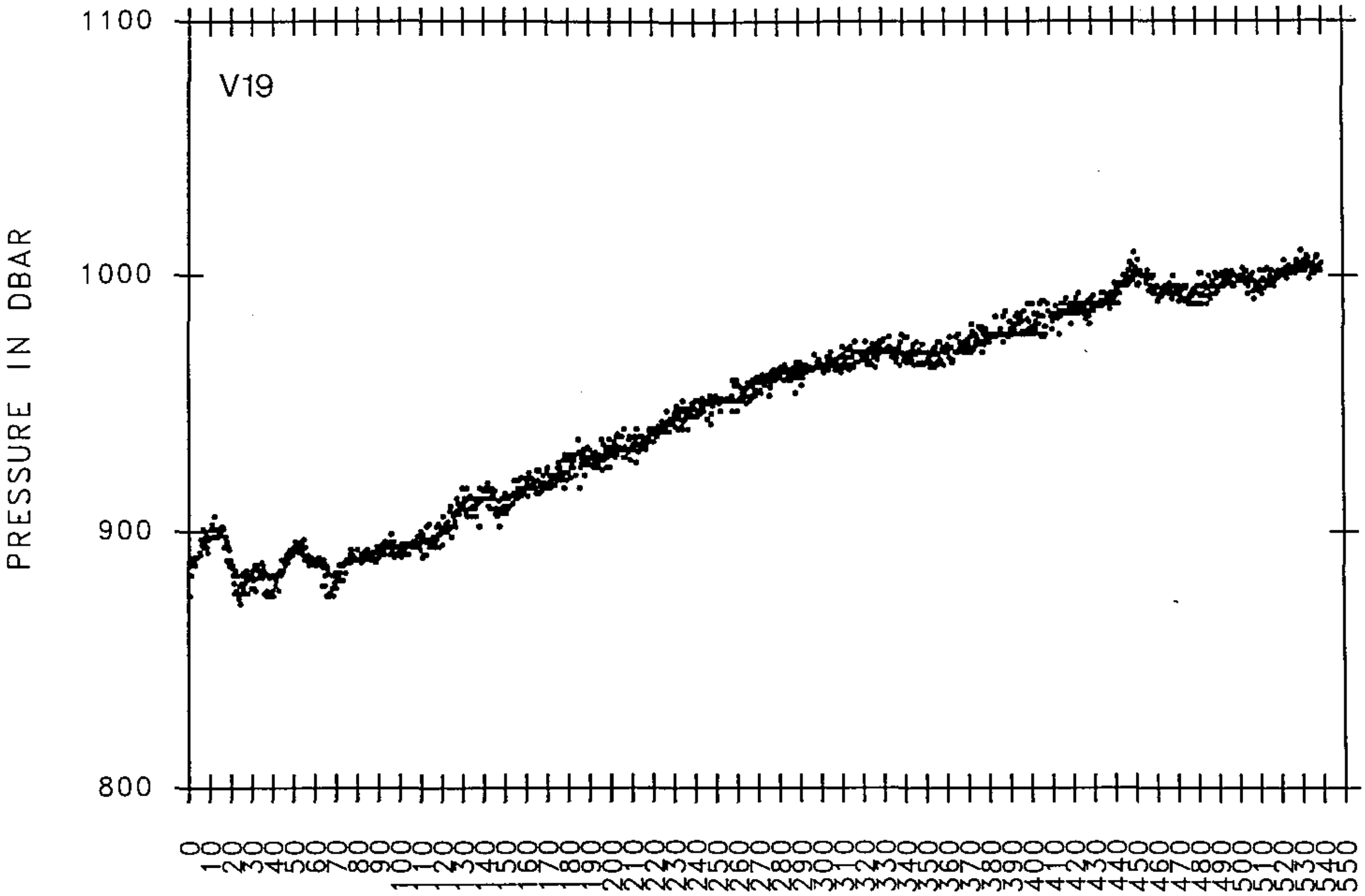
raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
v19.raw	v19.fin	v19.diaric

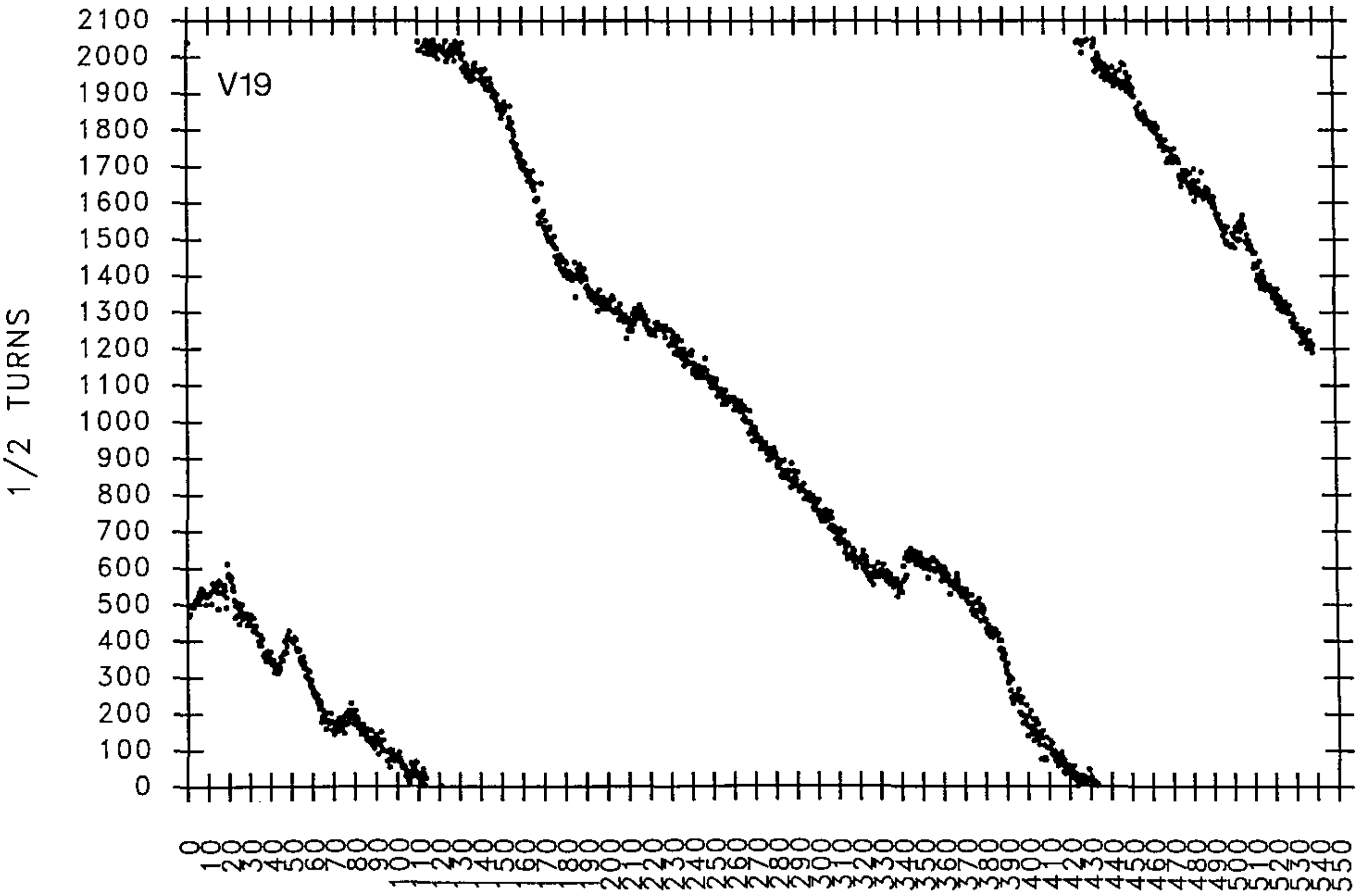


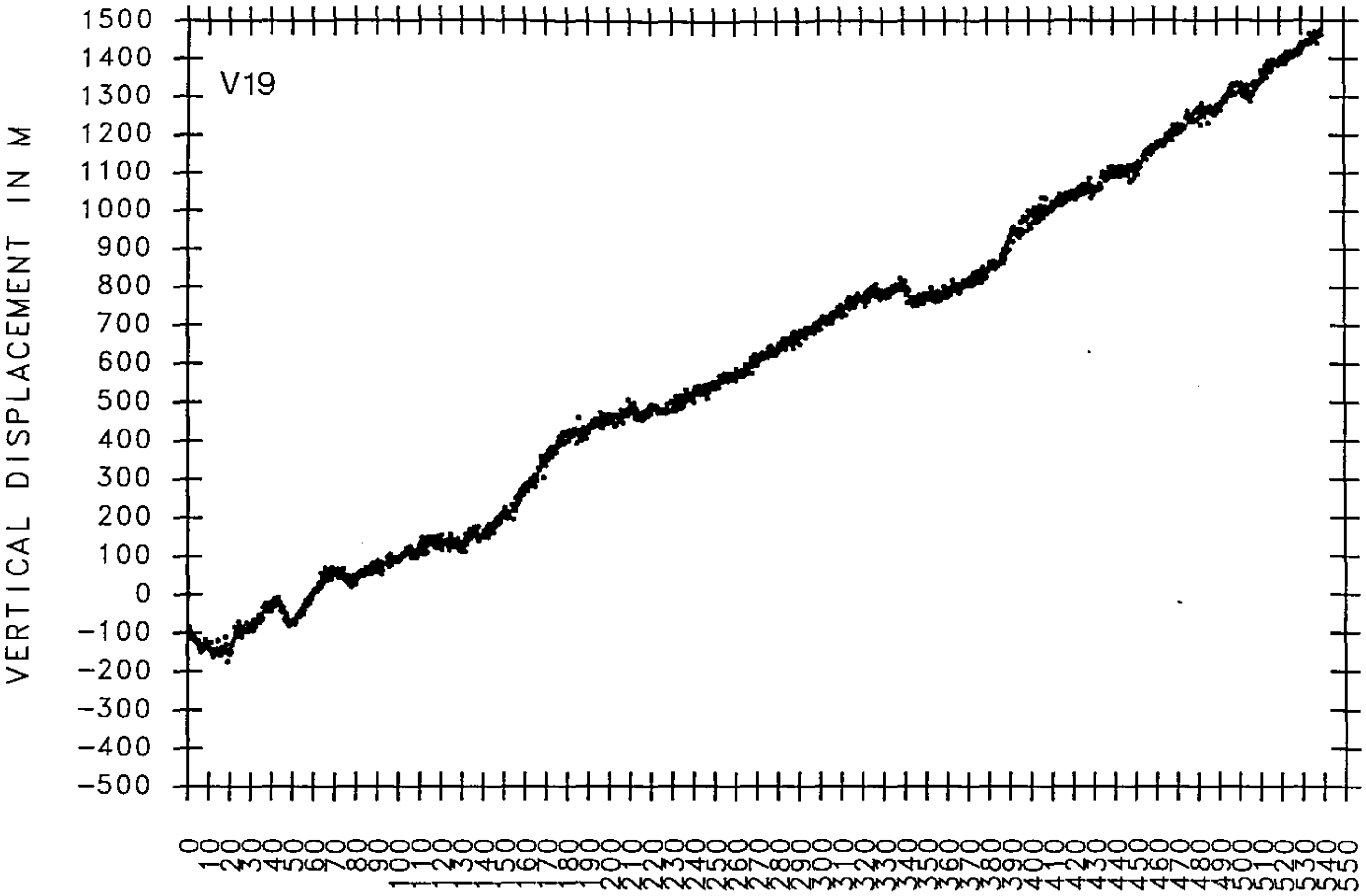
SAMBA V19

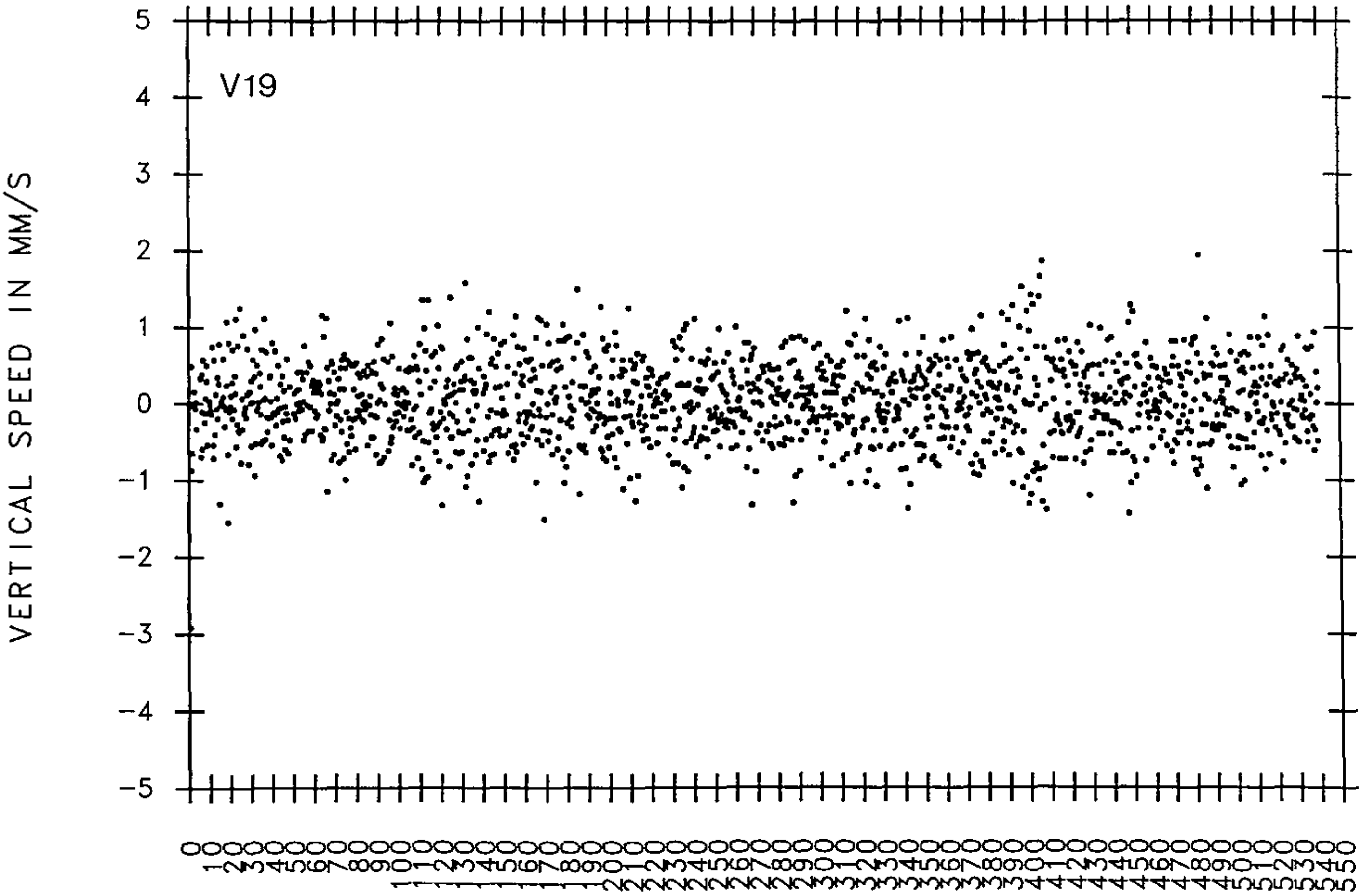


SAMBA V19 (FEBRUARY 1994 – AUGUST 1995)

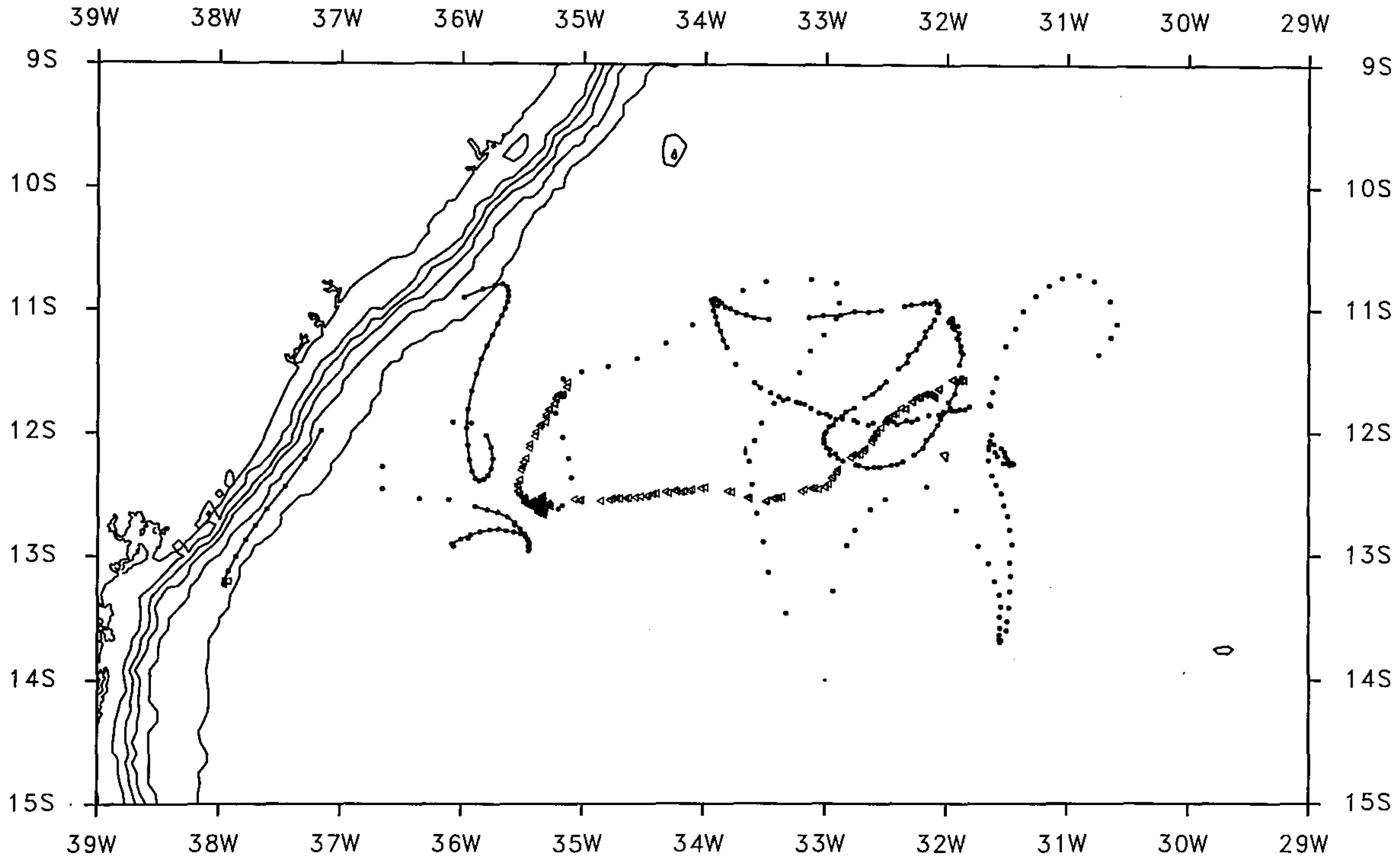

V19
PRESSURE IN DBAR
1100
1000
900
800


V19
1/2 TURNS
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0

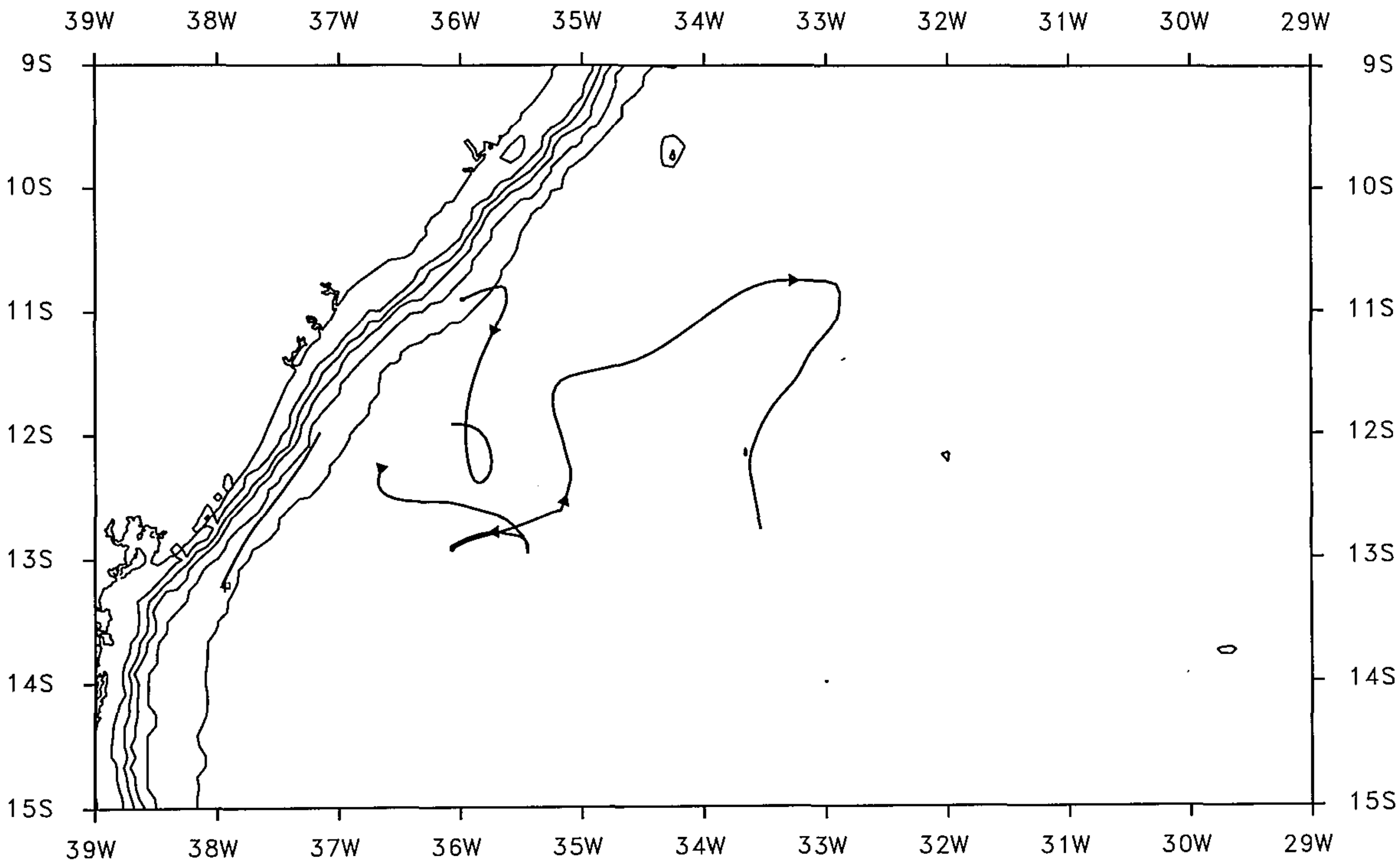

V19
VERTICAL DISPLACEMENT IN M


V19
VERTICAL SPEED IN MM/S

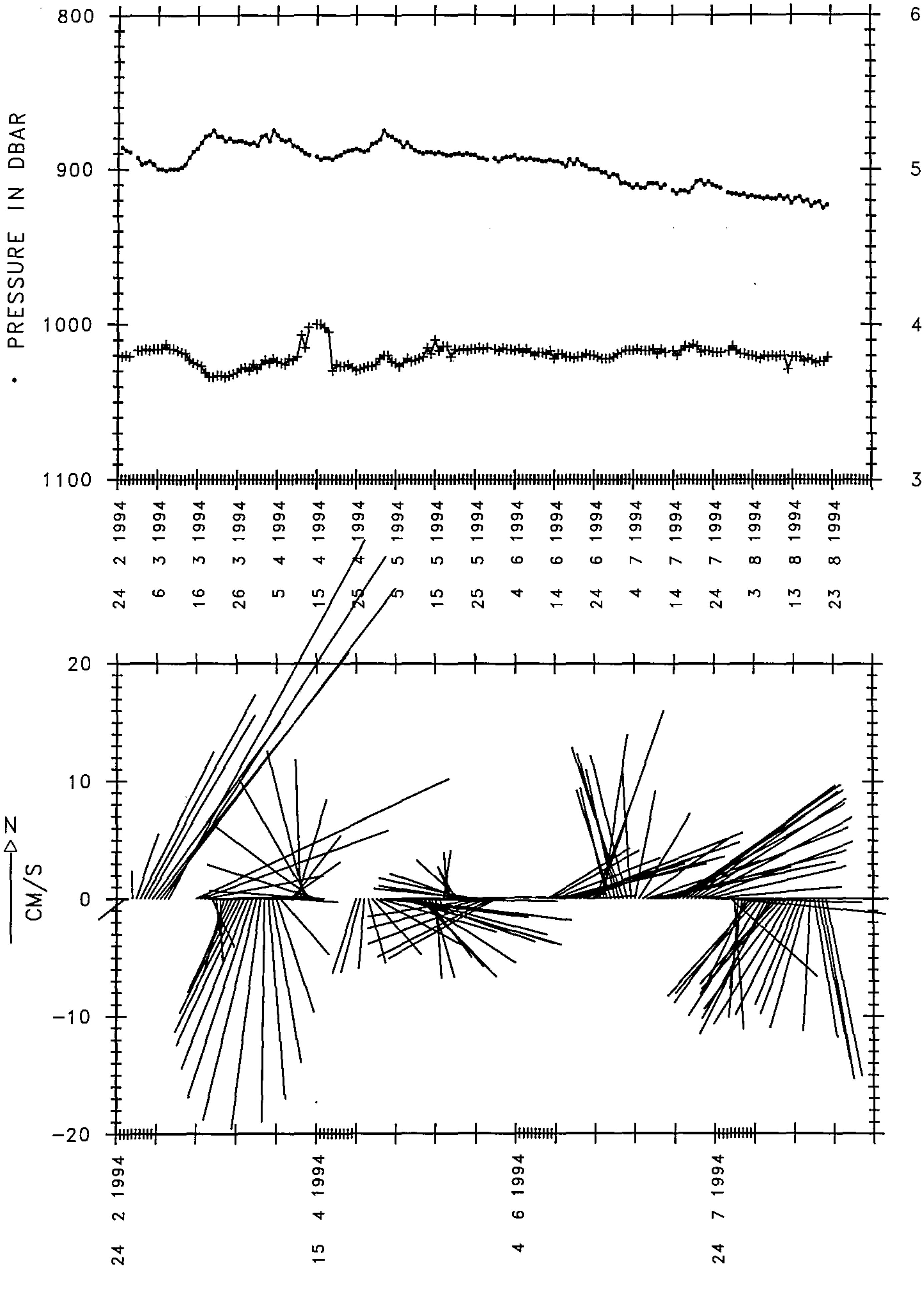
```
EXPERIMENT: SAMBA
--------------------

FLOAT: v19
---------

DATA FILE: v19.fin

  launch date                launch lat     launch long
 1994  2 24 11h UT            -13.205 S      -37.925 W
  date of first position     first lat      first long    init. pres.   init. temp.
 1994  2 26  1h UT            -13.221 S      -37.941 W        886 dbar      3.79 degC
  date of last position      last lat       last long     last pres.    last temp.
 1995  8 17  1h UT            -11.123 S      -31.909 W       1003 dbar      3.74 degC

Total displacement:
------------------

   537.0 days between first and last positions

  eastward displacement=     655 km    mean eastward velocity=   1.41 cm/s
  northward displacement=    233 km    mean northward velocity=  0.50 cm/s

Velocity time series statistics:
-------------------------------
  sampling interval= 24 h
  number of samples=  474

   47 degrees of freedom (assumed integral time scale is 5 days)

mean velocity components
  average east velocity comp.=   1.62 cm/s  [ -0.19,  3.43]
  average north velocity comp.=   0.40 cm/s  [ -1.58,  2.38]

variances
  variance of east velocity comp.=   39.94 cm2/s2  [  23.79,  56.09]
  variance of north velocity comp.=  48.13 cm2/s2  [  28.67,  67.59]

covariance
  covariance=  12.07 cm2/s2  [  -0.46,  24.61]

Eddy Kinetic Energy
  EKE=  44.04 cm2/s2  [  31.39,  56.68]

Temperature time series statistics:
----------------------------------
  sampling interval= 48 h
  number of samples=  464

  average temperature=   3.78 degC

  temperature variance=    0.0017 degC*degC

  covar(u,temp)=   0.00 cm.degC/s
  covar(v,temp)=   0.06 cm.degC/s

Comments:
--------
```



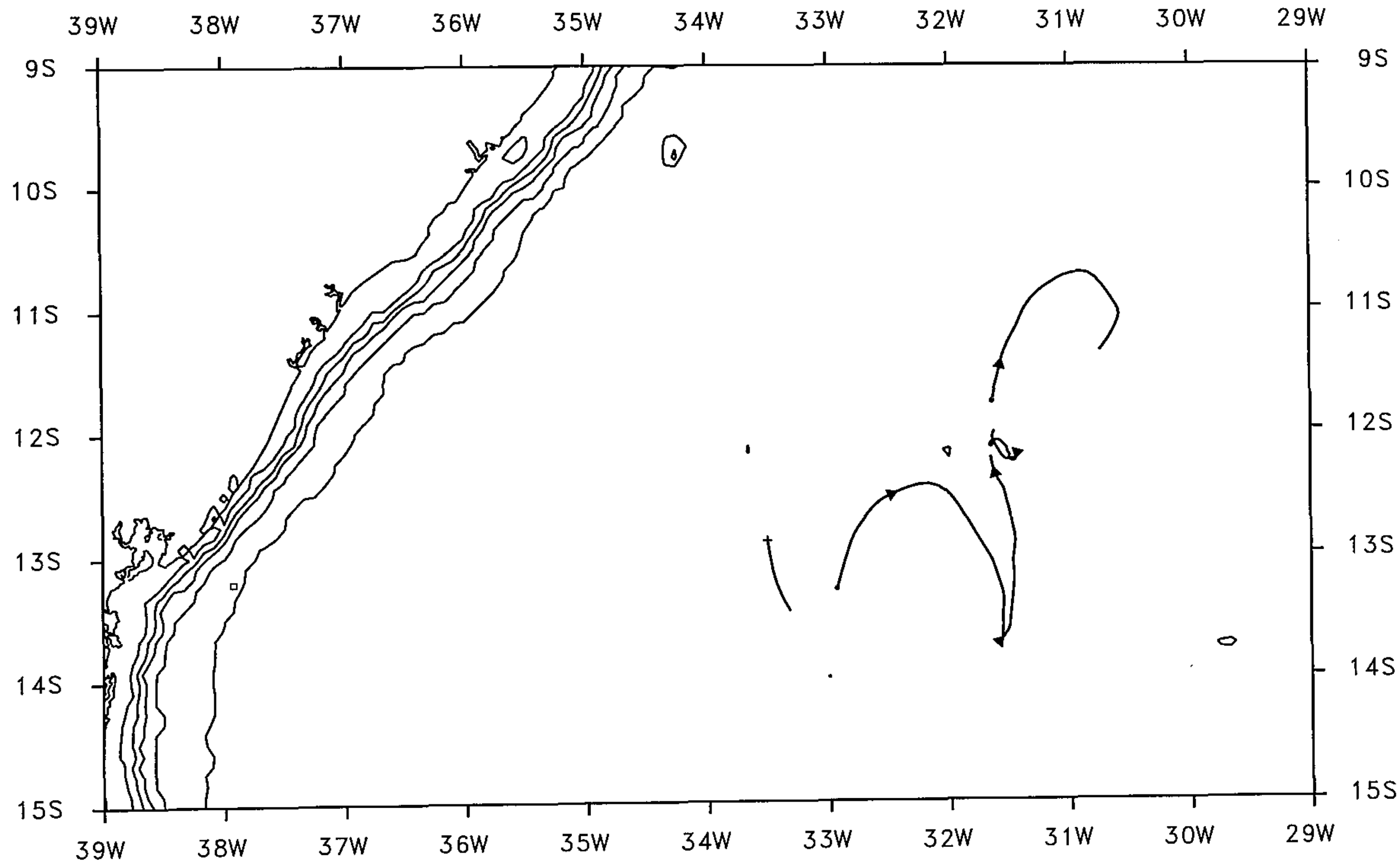
SAMBA V19 RAW POSITIONS



SAMBA V19 PART 1 LANCZOS FILTERED AND SPLINED

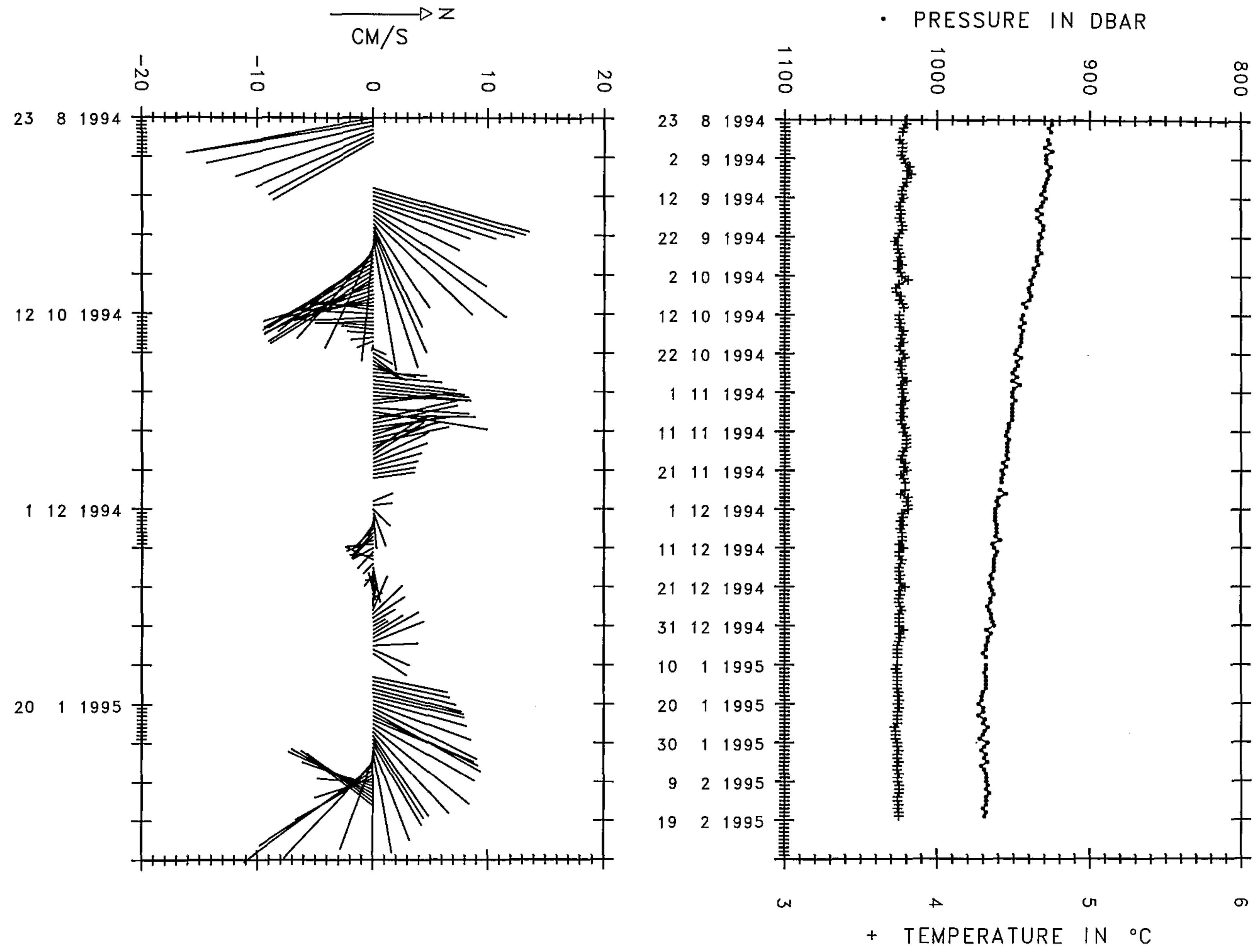


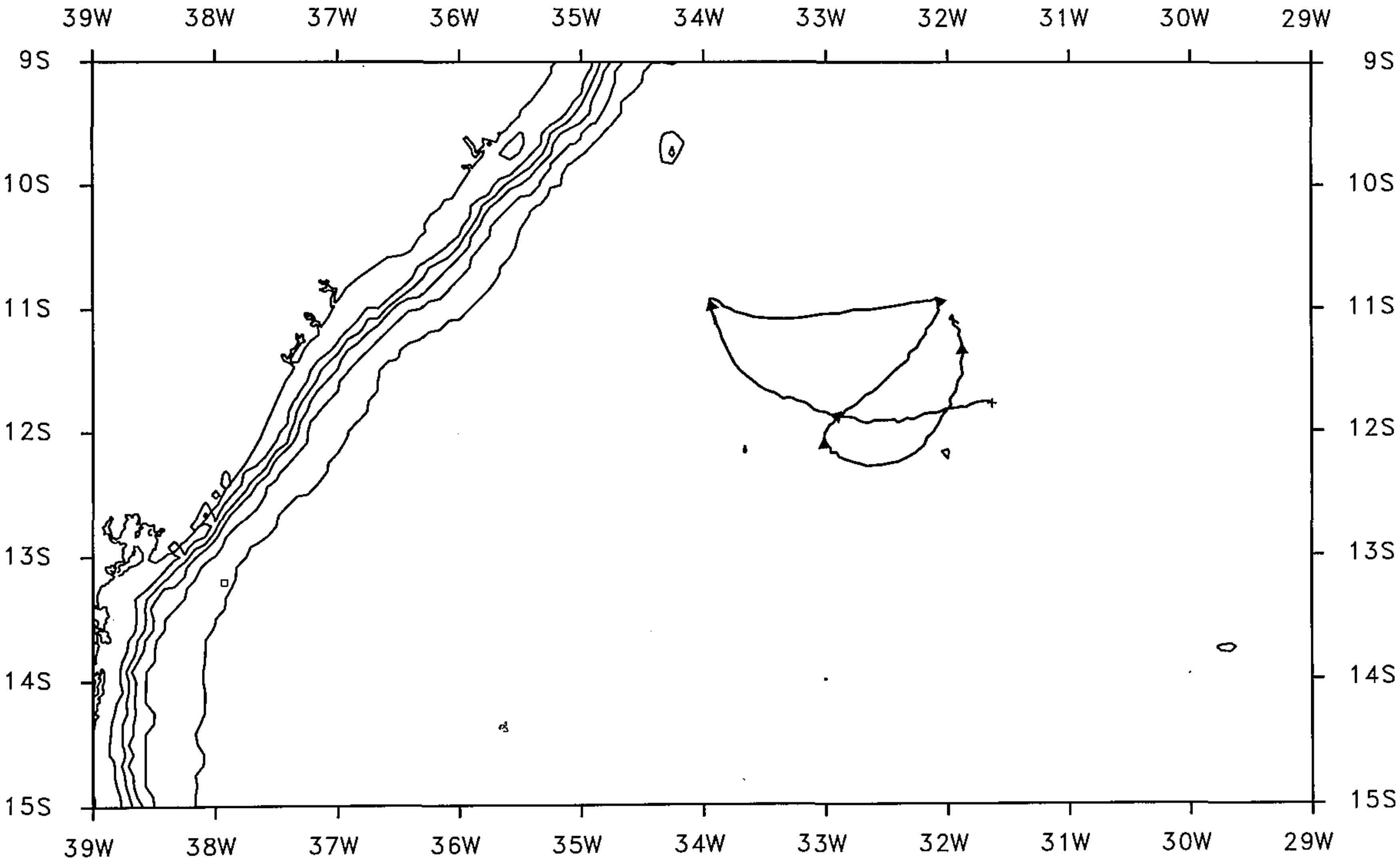
SAMBA V19 PART 1



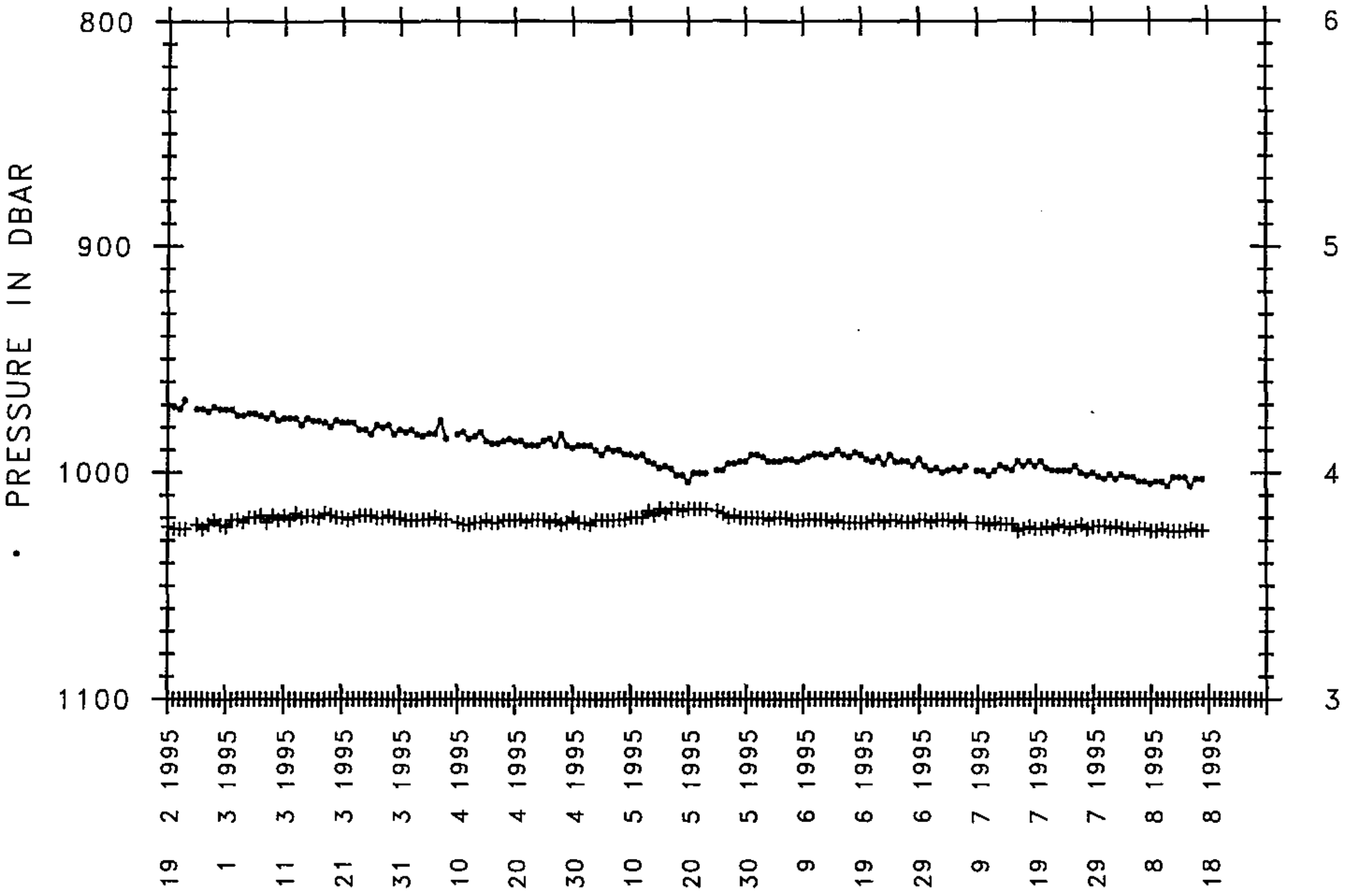
SAMBA V19 PART 2 LANCZOS FILTERED AND SPLINED

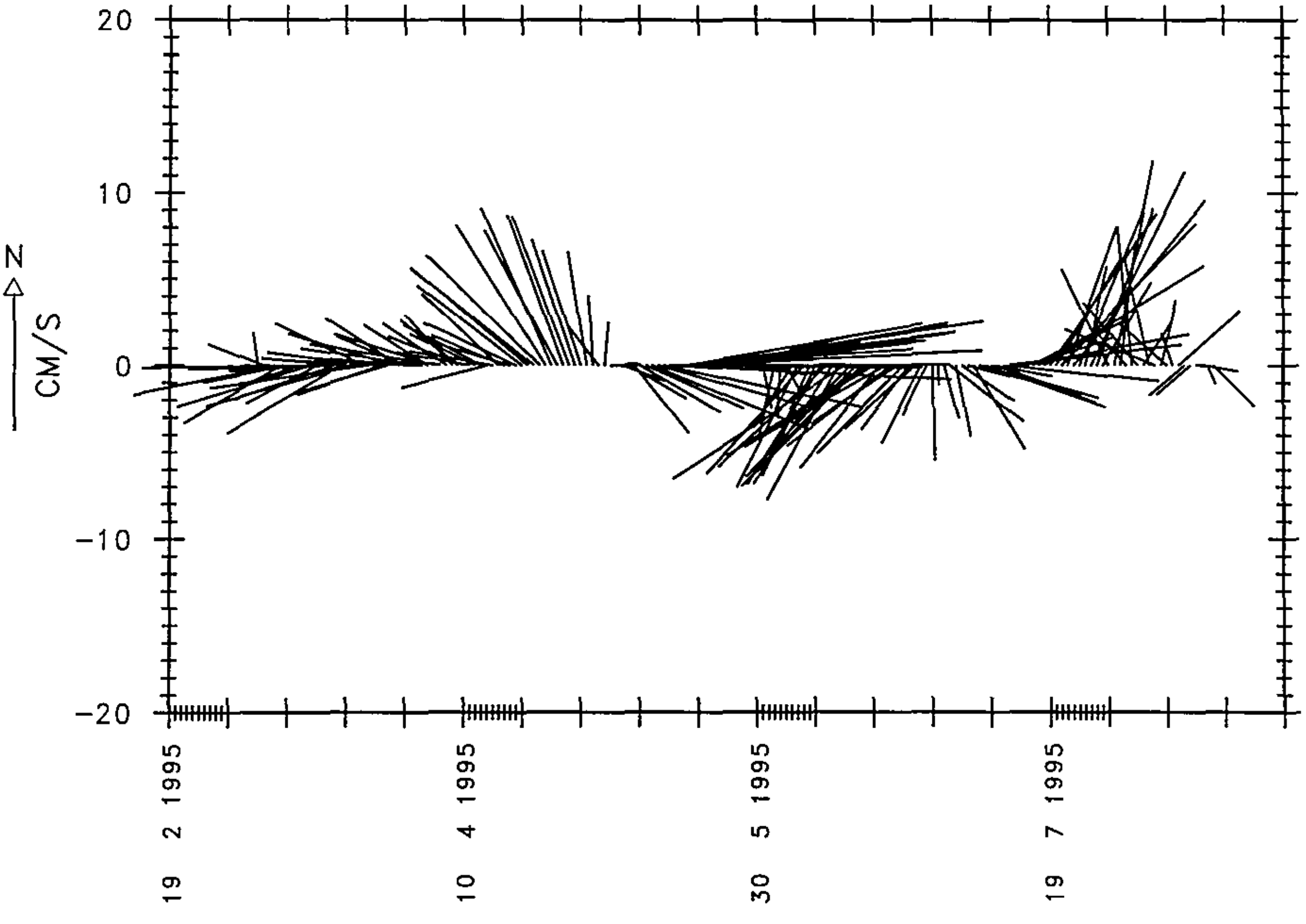
SAMBA V19 PART 2





SAMBA V19 PART 3 LANCZOS FILTERED AND SPLINED





SAMBA V19 PART 3

EXPERIMENT: SAMBA
FLOAT: ALFOS #02

LAUNCHED AT: 14°14.1'S 31°00.4'W on 22/02/1994 12h27 UT

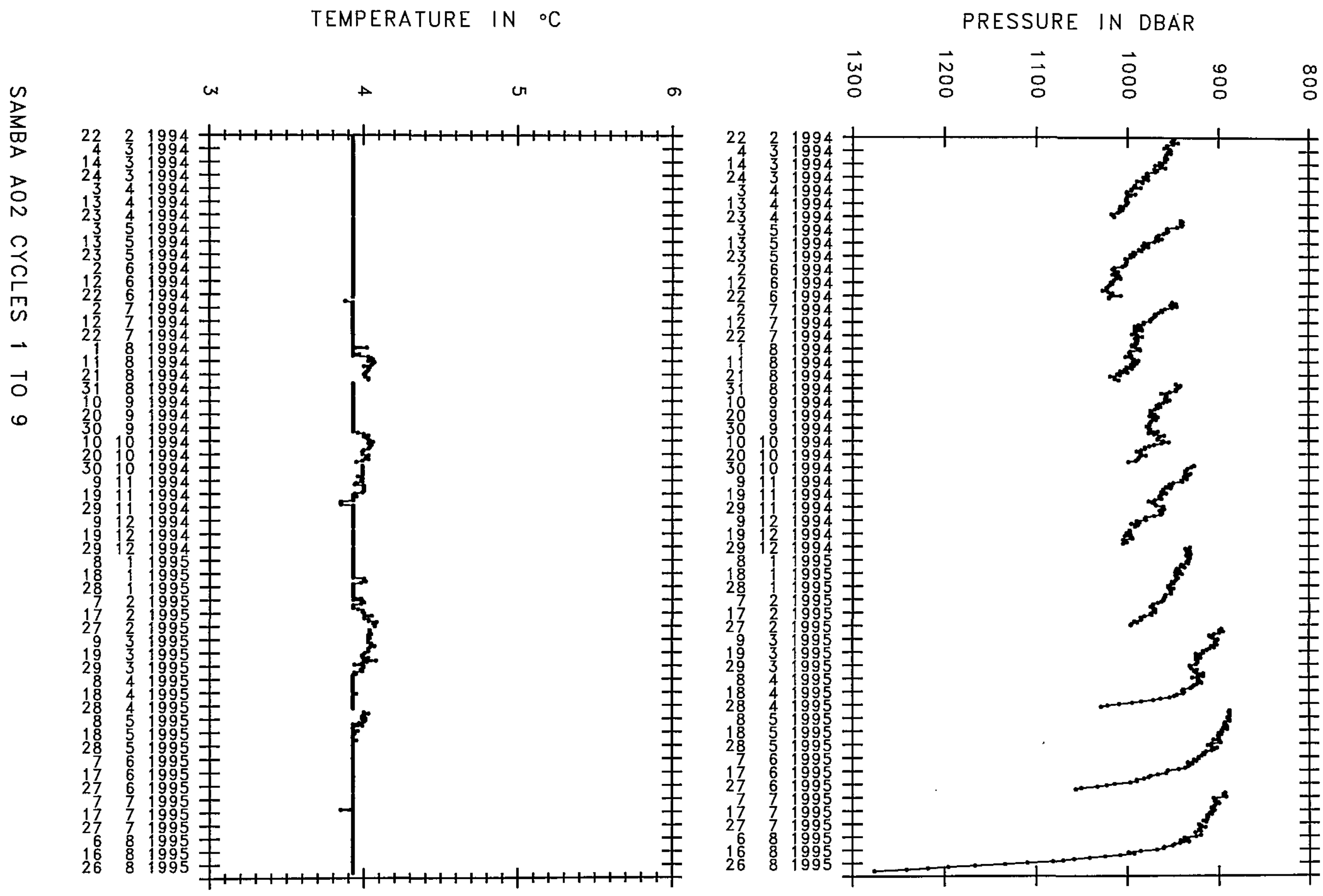
Ballasted at atmospheric pressure for 800 dbar approximately, and programmed for 50 cycles (60 days at depth, and 2 days at surface for ARGOS transmission).

Comments

No acoustic trajectory was retrieved from this float. Furthermore temperature seems erroneous and there is an uncertainty in the pressure calibration.

Data files

raw position data files	Lanczos filtered and splined data files	ARGOS surface position data file
a02-c1.raw	a02-c1.fin	a02-c1.diaric
a02-c2.raw	a02-c2.fin	a02-c2.diaric
a02-c3.raw	a02-c3.fin	a02-c3.diaric
a02-c4.raw	a02-c4.fin	a02-c4.diaric
a02-c5.raw	a02-c5.fin	a02-c5.diaric
a02-c6.raw	a02-c6.fin	a02-c6.diaric
a02-c7.raw	a02-c7.fin	a02-c7.diaric
a02-c8.raw	a02-c8.fin	a02-c8.diaric
a02-c9.raw	a02-c9.fin	a02-c9.diaric


SAMBA A02 CYCLES 1 TO 9
TEMPERATURE IN °C
3
4
5
6
PRESSURE IN DBAR
1300
1200
1100
1000
900
800
22 2 1994
4 3 1994
14 3 1994
24 3 1994
3 4 1994
13 4 1994
23 4 1994
3 5 1994
13 5 1994
23 5 1994
2 6 1994
12 6 1994
22 6 1994
2 7 1994
12 7 1994
22 7 1994
1 8 1994
11 8 1994
21 8 1994
31 8 1994
10 9 1994
20 9 1994
30 9 1994
10 10 1994
20 10 1994
30 10 1994
9 11 1994
19 11 1994
29 11 1994
9 12 1994
19 12 1994
29 12 1994
8 1 1995
18 1 1995
28 1 1995
7 2 1995
17 2 1995
27 2 1995
9 3 1995
19 3 1995
29 3 1995
8 4 1995
18 4 1995
28 4 1995
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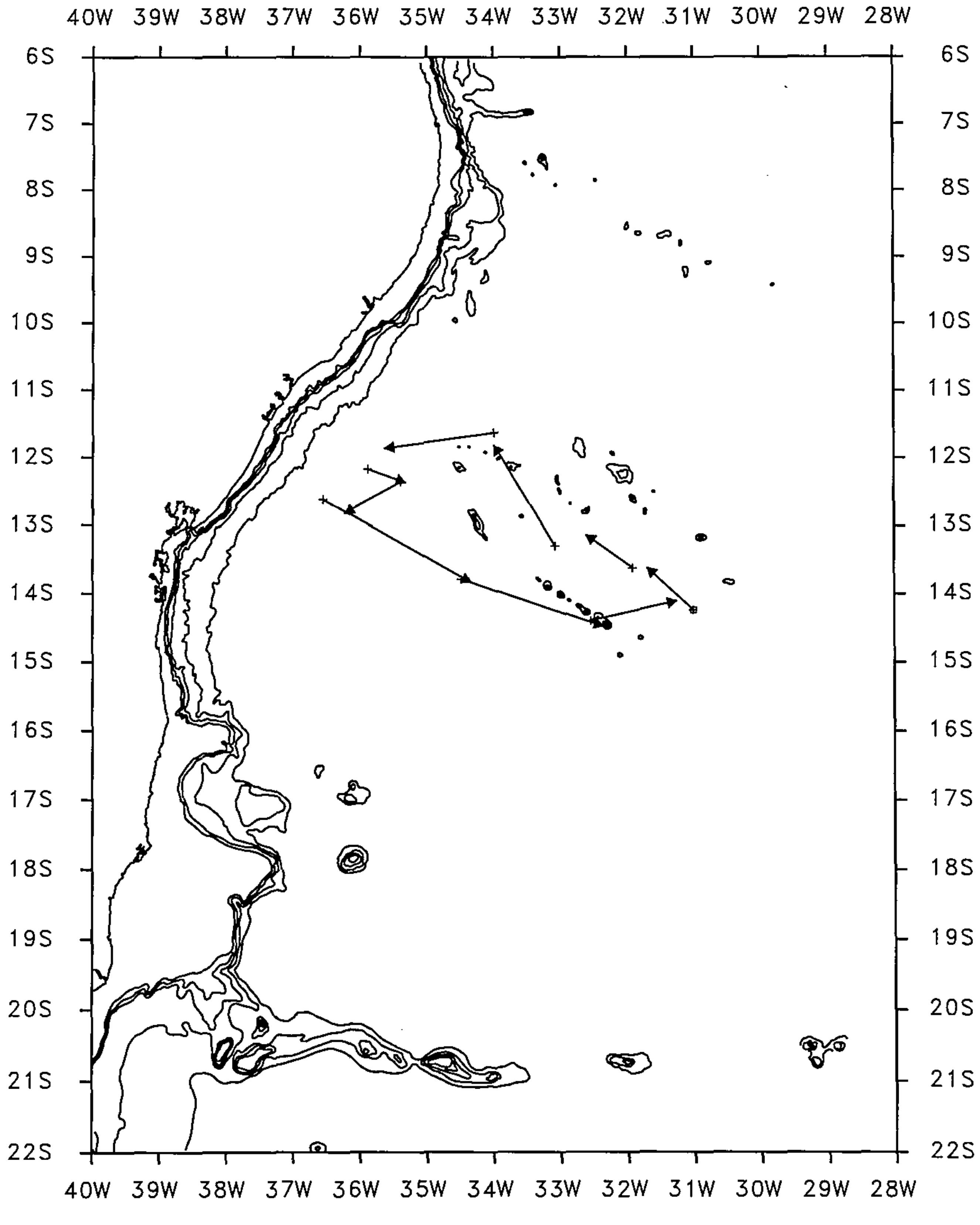
17 7 1995
27 7 1995
6 8 1995
16 8 1995
26 8 1995



SAMBA A02 CYCLES 1 TO 9 1000 DBAR 2-MONTH DISPLACEMENTS

4.7 Data return and float behaviour

Table 6 in section 4.5 summarizes the life history of the 20 MARVORs over their first nine cycles at depth. The data files (named .fin) contain the Lanczos filtered and splined positions, and the 24h average temperatures and pressures during submergence. The pressure values are corrected of the measured offsets at launch.

Table 7 gives for each MARVOR float the corresponding pressure offset just prior to launching (it is measured while the float in onboard, thus at atmospheric pressure, and should normally be 0). It is worth noting that three floats exhibit offsets outside the ±10 dbar interval (-11 dbar for #104, +12 dbar for #112 and -22 dbar for #119). Although most of the offsets did not vary between checks done in Brest and those done prior to launching, a few months apart, it is precisely the 3 floats that have the greatest offsets that evolved most (variation of -5 dbar, +10 dbar and -13 dbar respectively). The offset has proven sensitive to the torque applied to the pressure transducer when inserting it into the bottom end cap. However that cannot explain the variations with time since floats were not opened. There is probably an instability or an aging, at least near 0 pressure, in the pressure transducer. The question now is should we apply a correction (minus the offset value) to all the measured pressures, in particular at depth ? Tests done by SEASCAN indicate that generally the offset is propagated over the whole pressure range. So the offset correction has been done for the first cycle of the SAMBA1 MARVORs. This is corroborated by plotting T-P points from cycle 1 over the nearby temperature profile obtained with a CTD (Fig. 12 and 13). The second question is, should we apply the same correction to subsequent cycles, for which we have no way to know how the surface pressure offset may evolve since MARVOR doesn't transmit the measured pressure when at surface (future floats will do that however !). We have plotted for the first 3 cycles, the T-P points with and without the offset correction for several MARVORs and we have concluded that it is plausible to assume the offset doesn't change from one cycle to the other. Figure 14 shows the results for the worst float, MARVOR #119. Recalling that MARVOR measurements are 24 h averages and CTD ones instant, we can safely assume an accuracy on average T of ±0.03 °C and an accuracy on average P of ±20 dbar. Due to the pressure offset problem we cannot attain the ±10 dbar absolute accuracy on pressure that was hoped initially.

Table 8 gives the clock advances, obtained by comparison with UTC (within ±0.015 s) during the 2-day on-surface ARGOS transmissions. All the clocks are early and most of the drifts are quasi-linear, except that for MARVOR #113 which is rather parabolic. After one year and a half, the drifts are comprised between 0.4 s and 5.5 s (Fig. 15).

Table 9 gives the number of ARGOS messages received by the 2 NOAA satellites during the 44h55min of emission for the 20 MARVORs and their 9 cycles. It gives also the number of different messages received (which correspond to different daily listening phases). Between 48 and 60 different messages (60 are emitted) are received with an average of 58, that is 97 % of the data. (Mean redundancy is 247/58≈4.3). Mean number of satellite passes over the 44h55min of emission is 17.9 and ARGOS surface positions (localisation classes greater or equal 1) average to 15.

Table 9 bis and 9 ter give similar statistics for ALFOS #02 and VCM #19.

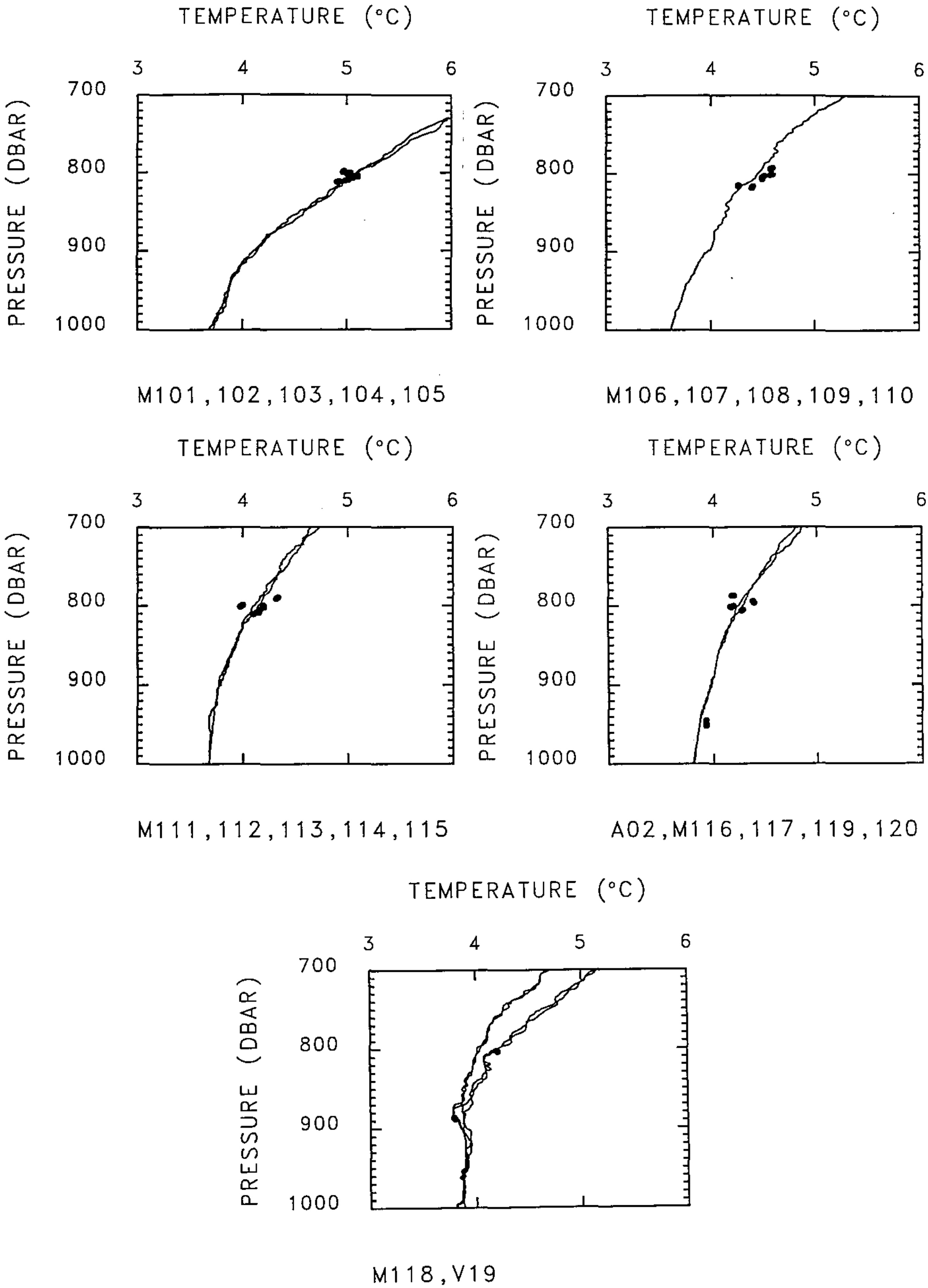


Figure 12 P-T curves from SAMBA1 MARVORs (offsets not corrected) compared with near-by CTD up and down profiles. Only data within 5 days of the CTD cast are plotted.

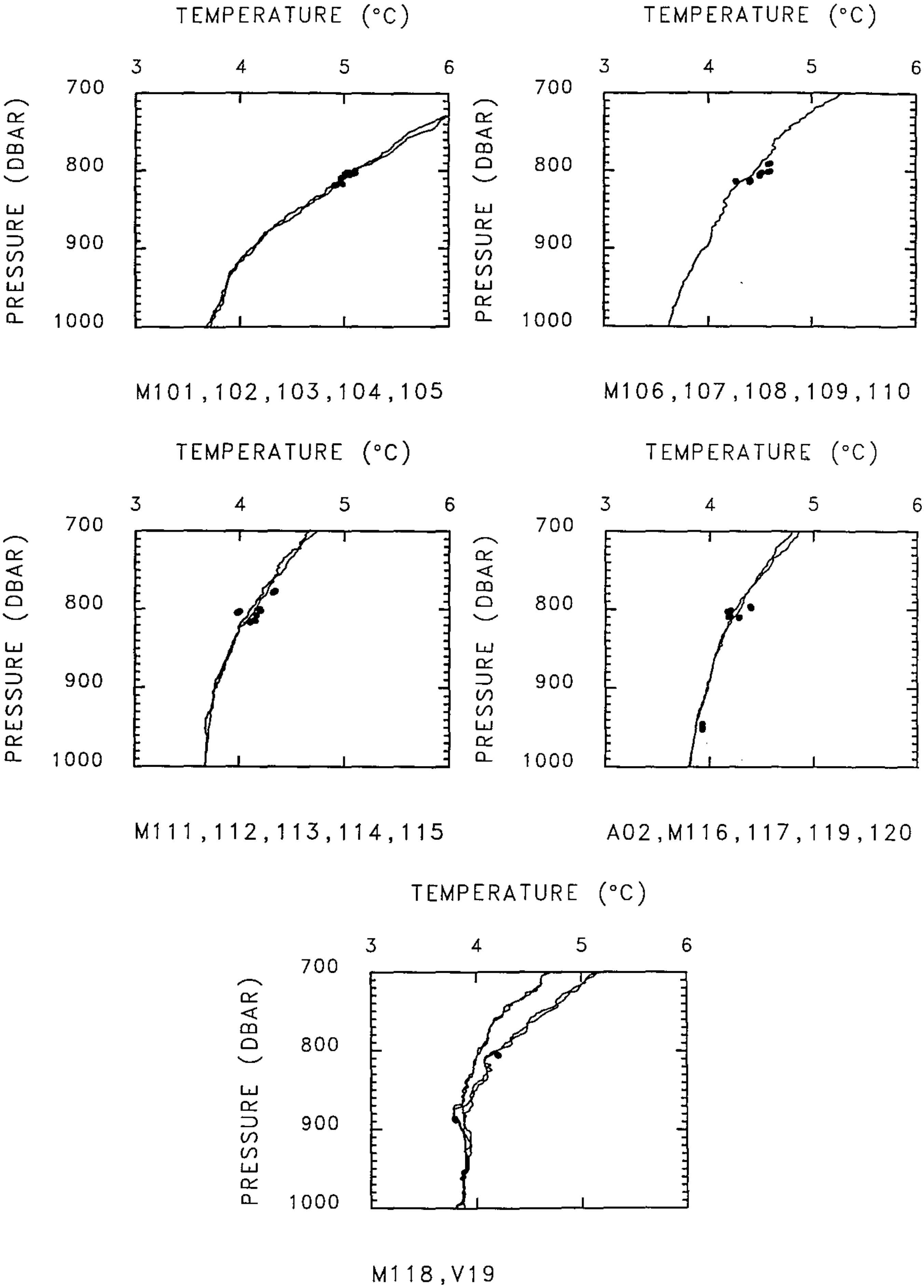
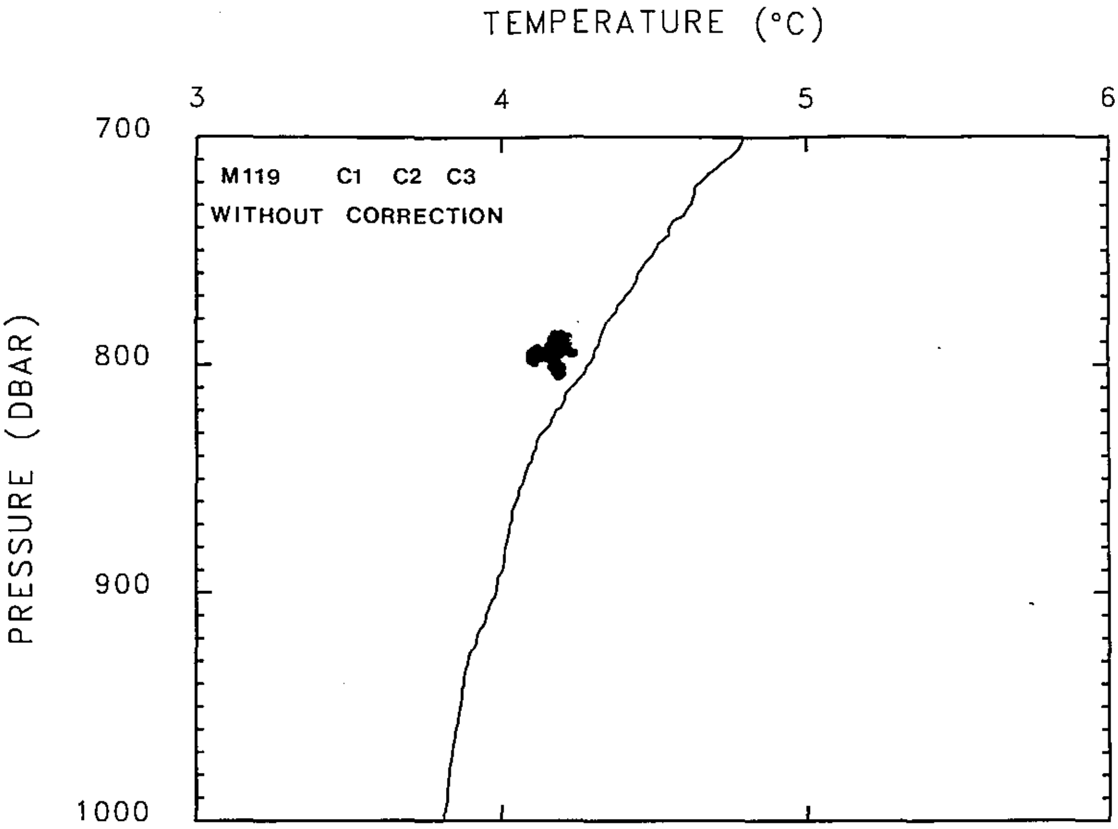


Figure 13 P-T curves from SAMBA1 MARVORs (offsets corrected) compared with near-by CTD up and down profiles. Only data within 5 days of the CTD cast are plotted.



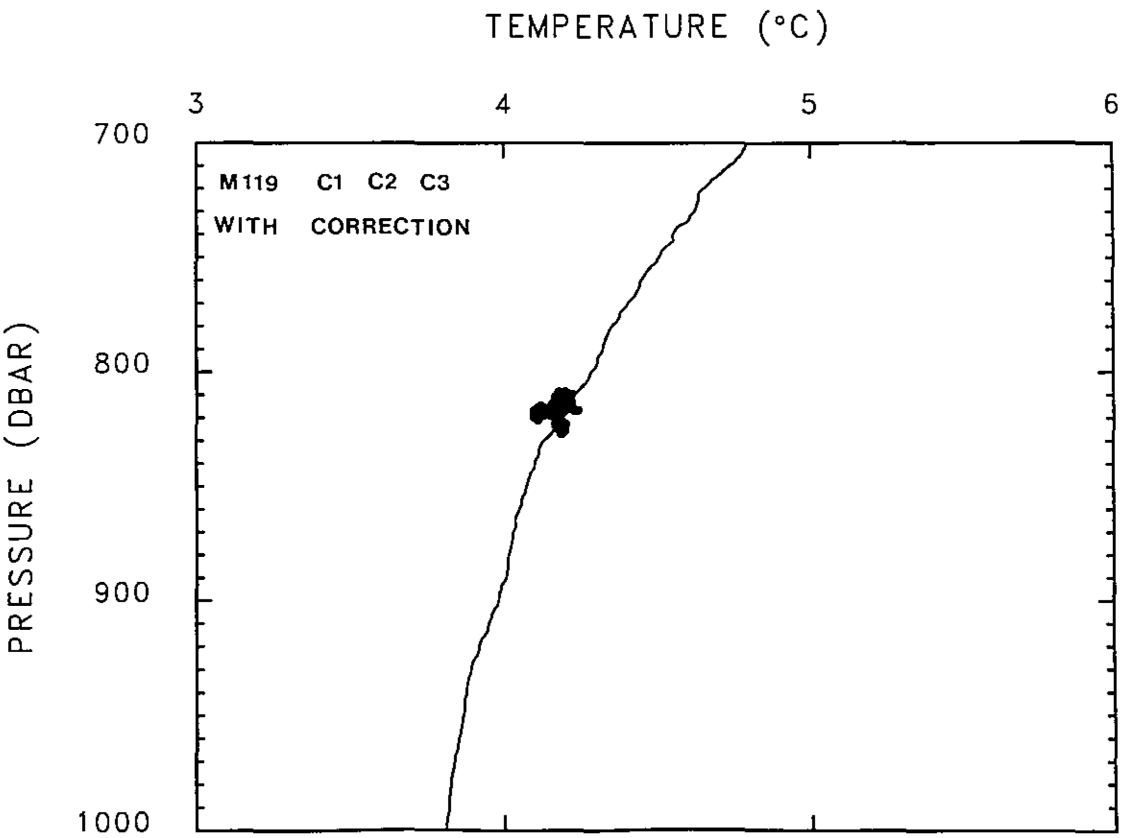


Figure 14 P-T curves from MARVOR #119, cycles 1, 2 and 3 (offset not corrected and corrected).

Table 7 MARVOR pressure offsets and clock advances at launch

MARVOR serial #	SEASCAN board #	Pressure offset in lab	Pressure offset at launch	First gap (dbar) and Gap (dbar)	Float clock advance at launch
101	31 [a]	+1,+2 dbar 3/12/1993	0 dbar	4, 15	+0.028 s (17/02/1994)
102	51	-2 dbar 3/12/1993	-2 dbar	2, 3	+0.025 s (17/02/1994)
103	43	-5 dbar 3/12/1993	-7 dbar	1, 10	+0.017 s (17/02/1994)
104	62	-6,-7 dbar 3/12/1993	-11 dbar	1, 10	+0.018 s (17/02/1994)
105	47	+5 dbar 4/12/1993	+5 dbar	9, 20	+0.009 s (17/02/1994)
106	25 [a]	-10 dbar 7/01/1994	0 dbar	4, 15	+0.003 s (19/02/1994)
107	52	+5,+6 dbar 4/12/1993	+2 dbar	6, 17	+0.011 s (19/02/1994)
108	38	+4,+5 dbar 6/12/1993	+3 dbar	7, 18	+0.025 s (19/02/1994)
109	71	0,+1 dbar 2/12/1993	+1 dbar	5, 16	+0.026 s (19/02/1994)
110	45	-1,0 dbar 2/12/1993	0 dbar	4, 15	+0.027 s (19/02/1994)
111	49	-5,-6 dbar 2/12/1993	-6 dbar	1, 10	+0.016 s (20/02/1994)
112	53	+2 dbar 2/12/1993	+12 dbar	16, 27	+0.019 s (20/02/1994)
113	41	-2 dbar 2/12/1993	-2 dbar	2, 13	+0.023 s (20/02/1994)
114	55	-3 dbar 2/12/1993	-4 dbar	1, 11	+0.024 s (20/02/1994)
115	61	-2 dbar 2/12/1993	0 dbar	4, 15	+0.010 s (20/02/1994)
116	46	-1 dbar 2/12/1993	-1 dbar	3, 14	+0.023 s (21/02/1994)
117	50	-2 dbar 4/12/1993	-2 dbar	2, 13	+0.016 s (21/02/1994)
118	66	-1 dbar 6/12/1993	-3 dbar	1, 12	+0.026 s (21/02/1994)
119	58	-9 dbar 4/12/1993	-22 dbar	1, 10	+0.016 s (21/02/1994)
120	59	-2,-3 dbar 6/12/1993	-5 dbar	1, 10	+0.008 s (21/02/1994)

a.Calibration checks were done at IFREMER metrology Lab.

Table 8 Clock advances over 1.5 year (9 cycles)

MARVOR serial #	end of cycle 1 (2 months)	end of cycle 2 (4 months)	end of cycle 3 (6 months)	end of cycle 4 (8 months)	end of cycle 5 (10 months)	end of cycle 6 (12 months)	end of cycle 7 (14 months)	end of cycle 8 (16 months)	end of cycle 9 (18 months)
101	0.3 s	0.7 s	1.0 s	1.3 s	1.6 s	1.9 s	2.2 s	2.5 s	2.8 s
102	0.3 s	0.6 s	0.8 s	1.2 s	1.5 s	1.8 s	2.1 s	2.4	2.8
103	0.2 s	0.4 s	0.5 s	0.7 s	0.9 s	1.0 s			
104	0.3 s	0.6 s	0.9 s	1.2 s	1.5 s	1.8 s	2.1 s	2.4 s	2.7 s
105	0.4 s	0.9 s	1.4 s	1.9 s	2.3 s	2.7 s	3.1 s	3.4 s	3.8 s
106	0.3 s	0.6 s	1.0 s	1.3 s	1.6 s	2.0 s	2.3 s	2.6 s	2.9 s
107	0.2 s	0.4 s	0.6 s	0.7 s	0.9 s	1.1 s	1.2 s	1.3 s	1.5 s
108	0.2 s	0.3 s	0.5 s	0.6 s	0.7 s	0.8 s	0.9 s	1.0 s	
109	0.1 s	0.3 s	0.4 s	0.6 s	0.7 s	0.8 s	0.9 s	1.0 s	1.1 s
110	0.3 s	0.6 s	0.9 s	1.3 s	1.6 s	1.8 s	2.2 s	2.5 s	2.9 s
111	0.6 s	1.2 s	1.7 s	2.3 s	2.9 s	3.4 s	3.9 s	4.4 s	5.0 s
112	0.3 s	0.7 s	1.0 s	1.3 s	1.7 s	2.0 s	2.2 s	2.5 s	2.8 s
113	0.3 s	0.5 s	0.7 s	0.9 s	1.0 s	1.0 s	0.8 s	0.6 s	0.4 s
114	0.3 s	0.5 s	0.7 s	0.9 s	1.0 s	1.2 s	1.3 s	1.4 s	1.6 s
115	0.2 s	0.4 s	0.6 s	0.8 s	1.0 s	1.2 s	1.3 s	1.5 s	1.7 s
116	0.4 s	0.7 s	1.1 s	1.5 s	1.9 s	2.2 s	2.5 s	2.8 s	3.2 s
117	0.3 s	0.5 s	0.8 s	1.1 s	1.3 s	1.6 s	1.8 s	2.0 s	2.3 s
118	0.4 s	0.8 s	1.2 s	1.6 s	2.0 s	2.4 s	2.8 s	3.2 s	3.6 s
119	0.7 s	1.3 s	2.0 s	2.6 s	3.2 s	3.8 s	4.4 s	5.0 s	5.5 s
120	0.2 s	0.5 s	0.7 s	1.0 s	1.3 s	1.5 s	1.7 s	2.0 s	2.2 s

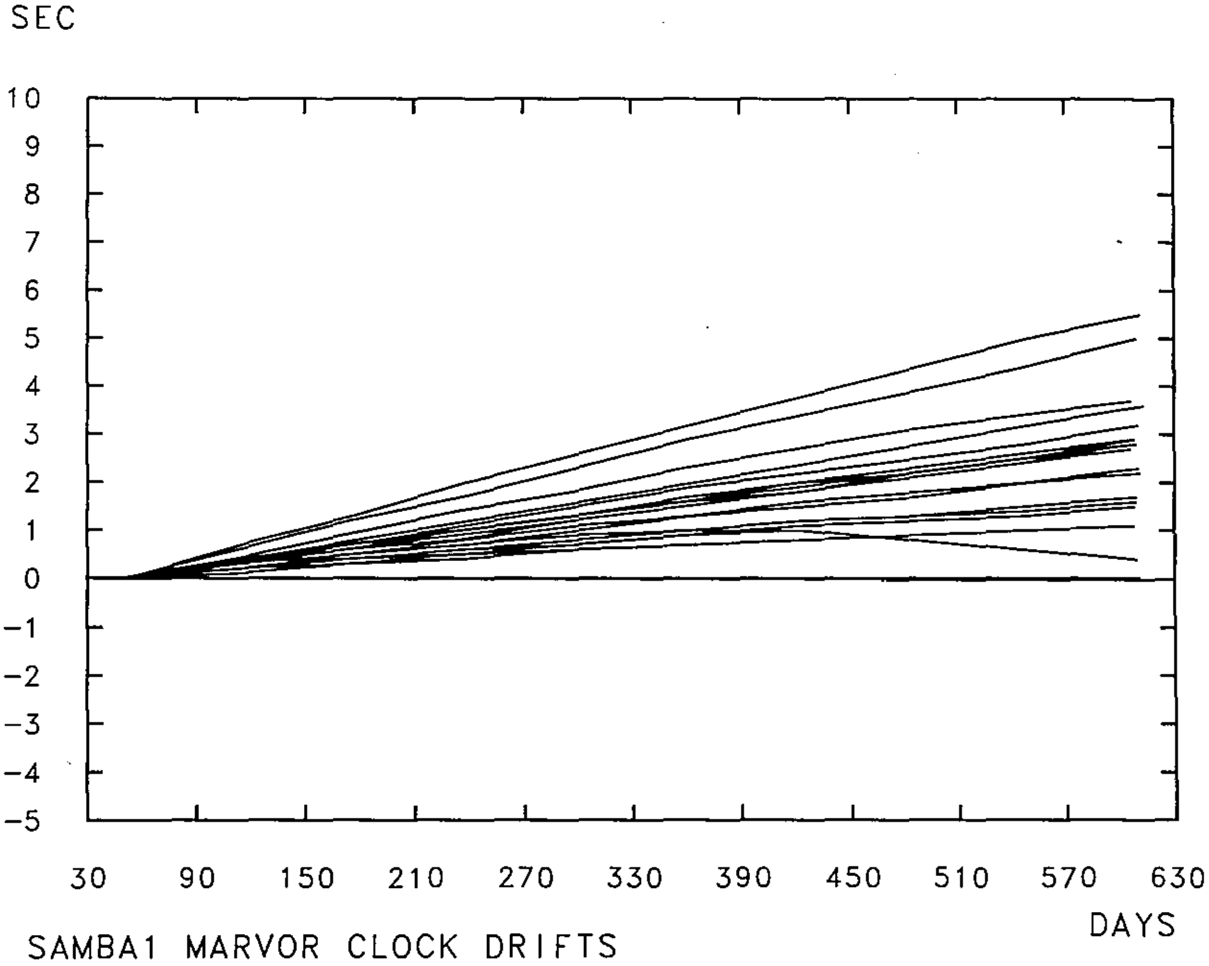


Figure 15 MARVOR float clock drifts.

Table 9 MARVOR ARGOS message statistics

MARVOR serial #	number of messages received by ARGOS sat.						number of satellite passes						number of listening phases received (60 max)						number of ARGOS surface position (loc. class ≥ 1)					
	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6
101	282	270	269	245	160	266	19	19	23	20	18	20	59	49	58	49	49	60	16	17	18	16	16	15
102	264	284	301	220	222	249	19	20	23	20	19	19	59	50	59	49	48	59	16	18	18	16	16	17
103	283	281	263	264	252	264	19	22	20	20	20	20	60	54	59	60	52	58	16	18	16	16	17	15
104	247	288	205	282	273	269	18	22	20	20	21	20	58	57	55	49	51	60	17	15	17	17	17	14
105	277	290	270	292	278	228	18	23	20	20	21	21	60	57	59	50	56	60	17	17	17	17	14	16
106	263	276	268	271	247	246	19	21	19	19	20	20	58	56	59	53	55	60	16	15	16	15	17	17
107	275	245	300	244	257	223	19	16	24	16	19	16	60	60	59	59	50	60	16	15	9	16	13	13
108	246	239	303	259	267	222	19	16	24	17	19	16	59	50	59	59	57	60	16	15	16	15	16	15
109	256	219	309	248	274	220	19	16	24	17	19	16	59	56	60	57	57	60	16	15	17	15	16	15
110	234	213	292	261	282	214	19	16	24	17	20	15	58	50	60	54	60	59	16	15	19	16	17	13
111	268	240	250	270	273	277	18	18	18	21	19	21	60	60	58	60	60	60	16	14	17	14	15	17
112	245	232	271	237	257	217	17	16	24	16	20	14	59	58	60	58	50	60	16	16	16	16	16	14
113	260	251	250	256	261	264	18	18	17	18	19	22	59	60	59	60	59	60	15	12	15	14	16	19
114	262	169	265	247	253	230	18	18	18	18	18	17	59	57	58	59	54	60	16	14	16	14	14	14
115	257	245	269	239	262	252	18	18	22	16	20	17	59	60	58	58	50	60	16	15	19	16	15	17
116	235	233	260	241	259	212	16	18	20	16	20	14	60	60	59	59	50	60	16	14	15	16	15	14

Table 9 MARVOR ARGOS message statistics

MARVOR serial #	number of messages received by ARGOS sat.						number of satellite passes						number of listening phases received (60 max)						number of ARGOS surface position (loc. class ≥ 1)					
	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6
117	249	244	249	208	222	220	16	18	20	16	18	14	60	60	56	59	59	60	16	16	15	16	15	14
118	246	256	247	255	249	235	20	16	18	20	16	17	58	60	52	58	59	60	15	16	15	14	16	14
119	238	253	251	223	261	222	17	19	19	15	20	14	59	60	58	50	51	60	16	15	11	12	15	14
120	230	265	253	187	267	226	15	19	20	15	19	15	60	60	58	49	60	59	15	16	15	12	15	14

MARVOR serial #	number of messages received by ARGOS sat.						number of satellite passes						number of listening phases received (60 max)						number of ARGOS surface position (loc. class ≥ 1)					
	c7	c8	c9				c7	c8	c9				c7	c8	c9				c7	c8	c9			
101	238	226	253				20	14	20				60	59	60				15	14	16			
102	228	270	227				19	21	16				59	60	60				17	13	14			
103																								
104	290	272	265				21	21	20				60	60	60				17	15	14			
105	269	229	242				21	17	20				60	60	60				18	13	15			
106	267	219	230				20	16	15				60	60	60				16	15	14			
107	270	281	208				20	21	16				60	60	60				12	14	14			
108	244	243					19	19					60	60					14	12				
109	245	263	232				20	21	15				60	60	60				14	14	14			

MARVOR serial #	number of messages received by ARGOS sat.						number of satellite passes						number of listening phases received (60 max)						number of ARGOS surface position (loc. class ≥ 1)					
	c7	c8	c9				c7	c8	c9				c7	c8	c9				c7	c8	c9			
110	235	287	252				21	21	17				60	60	60				16	16	15			
111	238	238	258				17	18	20				57	60	60				14	15	15			
112	226	222	211				17	17	17				60	60	60				13	14	11			
113	229	208	247				15	17	19				60	58	59				13	15	14			
114	226	228	203				17	19	15				60	60	59				14	14	13			
115	246	263	226				18	20	15				60	60	60				5	14	13			
116	235	246	226				19	17	15				60	60	60				14	15	14			
117	238	228	235				19	16	16				60	60	60				14	13	15			
118	230	232	236				15	19	16				60	60	60				13	12	15			
119	226	236	245				19	16	17				60	60	60				13	13	13			
120	245	241	233				21	16	17				60	60	60				17	15	14			

Table 9 bis ALFOS ARGOS message statistics

ALFOS serial #	number of messages received by ARGOS sat.						number of satellite passes						number of float messages received (45 max)						number of ARGOS surface position (loc. class ≥ 1)					
	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6	c1	c2	c3	c4	c5	c6
02	205	187	201	181	201	207	16	18	20	16	17	15	44	45	45	45	44	45	16	13	14	16	15	14

ALFOS serial #	number of messages received by ARGOS sat.						number of satellite passes						number of float messages received (45 max)						number of ARGOS surface position (loc. class ≥ 1)					
	c7	c8	c9				c7	c8	c9				c7	c8	c9				c7	c8	c9			
02	217	202	192				21	16	15				60	60	60				16	14	14fss			

Table 9 ter VCM ARGOS message statistics

VCM serial #	number of messages received by ARGOS sat.	number of satellite passes	number of float messages received (540 max)	number of ARGOS surface position (loc. class ≥ 1)
19	3127	233	527	192

ARGOS localisation classes n°1 or greater correspond to an accuracy of ±1 km or better. ARGOS positions obtained with a fixed float emitting outside the lab have confirmed that accuracy (Fig. 16).

Generally, MARVOR floats took an order of 10 h to sink to their prescribed depth and less than 3 h to rise back to the surface, while their first ARGOS emission started near 5h30min UT.

For those floats that were positionned the last (and 60th) day of a given cycle (the position can be assigned to ≈1h UT since all sound sources emit at 0h30, 1h00 or 1h30 UT), the first ARGOS surface position can be used as a check of the accuracy of acoustic positioning. Differences are generally of the order of 5 km. For floats not far from sound sources (let us say less than 500 km) uncertainties in mean speed of sound (±5 m s^{-1} at most) cannot account for errors in the times of propagation greater than ±1 s. It is thus possible in that case, as mentionned in section 4.5, to estimate the sound source clock advance with an assumed accuracy of ±3 s, (only that because of the inadequate resolution of the float correlator).

Precisely, we have obtained the following advances for the German and American sound sources :

	46	51	52	53	54	69	75	76	77
estimated advance	-1 s (1994)	-2 s (1994)	-2 s -2.5 s (1994)	-1 s -2 s (1994)	-1 s	-2 s (1994)	-1 s (1994)	-2 s (1994)	-6 s -7 s (1994)
measured advance	0 s (Oct. 1992) -5 s (March 1995)	0 s (Nov. 1992) -3 s (March 1995)	0 s (Oct.1992) -4.8 s (Feb. 1995)	0 s (Oct. 1992) -3.8 s (March 1995)	0 s (Oct. 1992) -4.8 s (Feb. 1995)	0 s (Oct. 1992) -2.7 s (March 1995)	0 s (Oct. 1992) -4.7 s (Feb. 1995)	0 s (Nov. 1992) -5.6 s (Feb. 1995)	0 s (Oct. 1992) -10.8 s (April 1995)

	K1	K2	K3	K4	KB	K6
estimated advance	-3 s -4 s (1994)	-3 s (1994)	-3 s -4 s (1994)		0 s -1 s (1994)	
measured advance						

The inadequate resolution of the MARVOR or VCM correlator is illustrated in Figure 17. Acoustical reception of sound signals was very good for the German sound sources (they are at ≈1000 m depth, thus near the SOFAR channel axis), but not so good for the US sound sources (but they are at ≈2000 m depth), and in between for the French sound sources. Recall however that the sound source array has been set, in close cooperation with WHOI and IFM Kiel, to give a sound coverage for floats at 800 m and at 2500 m and even a few at 4000 m (the latter being classical RAFOS from WHOI).

The most distant source heard by one MARVOR was of course a german source, at a 3200 km distance ! Although quite satisfying per se, such a performance is not necessarily much useful, since error on the distance may be large, and due to the topography, we need many sources rather closely packed to track the floats through the seamounts or near the continental coasts.

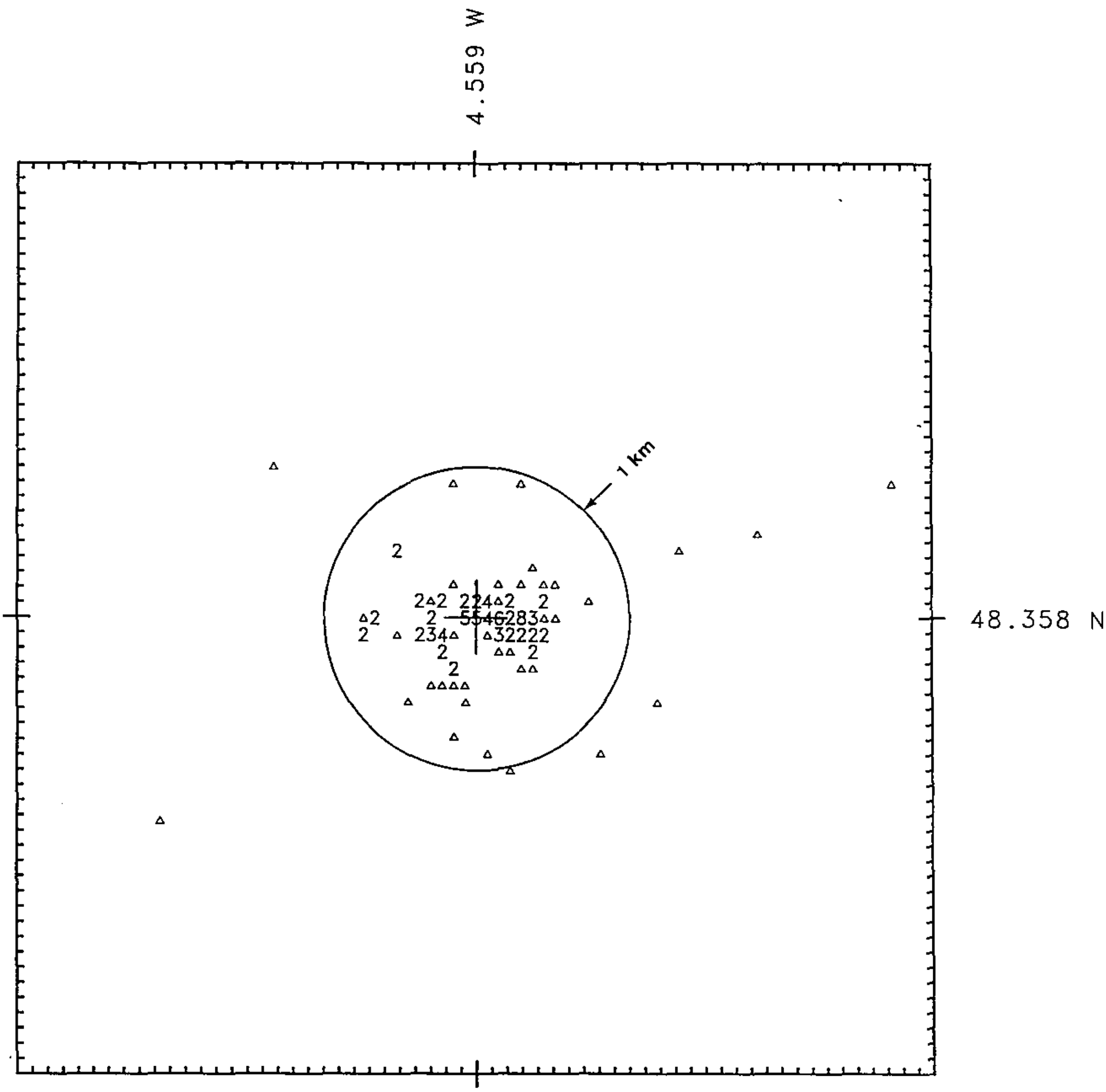


Figure 16 ARGOS position scatter plot (localisation classes ≥ 1) for the SAMBA1 MARVORs during tests at a fixed point (48.358°N, 4.559°W GPS position). Numbers indicate identical positions.

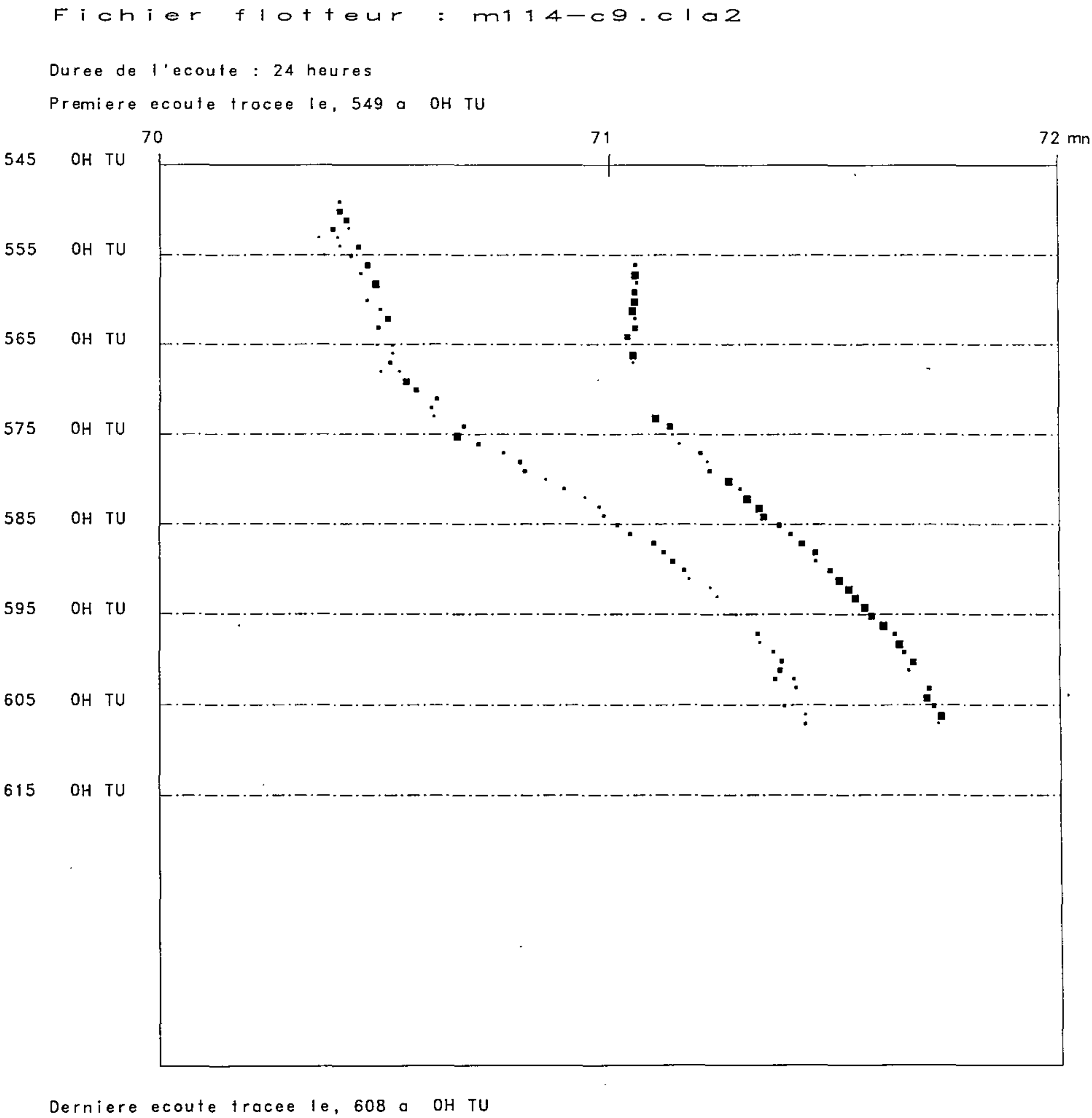


Figure 17 TOAs received by MARVOR float #114 during its ninth cycle, showing (at times) the two correlation peaks separated by more than 2 s.

More surprising are differences in correlation height (or signal strength) for nearby floats and the same distant source. There are perhaps some variations in the hydrophone characteristics.

As the pressure and temperature values recorded are averages over 24 hourly consecutive instant measurements, and the average is calculated at the end of the last (and third) listening window of each daily phase at depth, it follows that the pressure and temperature transmitted within ARGOS message nº 00 (corresponding to the first daily phase at depth) are not representative of the deep values since the float was sinking from the surface to its operational pressure the day before. Thus temperature is higher and pressure is lower, than they should be. These first average temperature and pressure (given in message nº 00) were removed from the .raw and .fin files.

For certain floats and cycles, the pressure time series (thus the float depth variation) does show rather sudden jumps, as if the float was sinking an order of a few tens of meters in one or two days. Furthermore, for a few others (MARVOR #101 during its sixth cycle, MARVOR #102 and #117 during their seventh and eighth cycles, MARVOR #110 during its seventh, eighth and ninth cycles), the pressure changes exhibited are much more dramatic, since the floats dived down, over an order of 10 days to various depths ranging from 1000 m to 2500 m.

Nominal leakage of the valves is of the order of a few mm^3 h^{-1}, which implies only a deepening of the order of 0.5 m day^{-1}. The very slow sinking of most of the MARVOR floats seen on the pressure time series may be related to this nominal leakage.

Could there be, after several months under pressure, some phenomena which deteriorate the valve functioning or integrity, so that leakages 10 to 100 times the nominal value could happen ? Or could that be due either to an aging of the pressure transducer or electronic board ? A leakage could also happen at the valve (more precisely the ball) which prevents oil from flowing back through the pump.

On an other hand, floats may experience naturally pressure changes of a few tens of meters, but the time scales involved based on our present ocean knowledge would be rather characteristic of mesoscale phenomena (i.e. of the order of 10 days or more). However most (but not all) of the dramatic sinkings happen near the western boundary when floats are entrained within the IWBC (Intermediate Western Boundary Current). Are there any short time oceanic phenomena that could be called upon to explain the floats attitudes ? We don't think of any, presently ! Although the pressure transducer used by MARVOR is not perfect, correlating the temperature with the pressure (Fig. 18) eliminates the possibility of a drift in the pressure transducer that could explain the deep divings !

Thus, to help solve the probable hydraulic malfunction, we decided in late June 1995, to conduct long-term experiments in the lab with 4 MARVOR hydraulic parts, under 800 dbar pressure. After 2 months during which nothing happened, 2 blocs (one in IFREMER and one in H. R. Leduc factory) began to show leakages above specifications (thus > 50 mm^3 day^{-1}) which reproduced strickingly the float behaviours at sea. Valves were then dismantled and carefully examined. Little holes have been discovered on the contact surfaces, that could explain the leakages. These holes are probably caused by a bad alloy (manganese sulfure inclusions that would dissolve under action of the oil used). A new valve is presently under development, that will solve the problems encountered so far.

Had all the MARVOR floats worked perfectly, we would have obtained 29.6 float-years of data (10800 days exactly). Instead, 10252 days (28.1 years) of data were recovered in the [700,900] dbar pressure range, and 10008 days (27.4 years) in the [750,850] dbar pressure range; that is a data return of 94.9 % or 92.7 % respectively. Irrespective of the pressure, a total of 10560 MARVOR-days have been recovered so far.

Furthermore, MARVOR #103 landed on a shallow bottom at the beginning of its seventh cycle, and MARVOR #108 did the same at the beginning of its ninth cycle. Thus 240 days were lost in that way ! Fortunately, that landing difficulty should be mostly overcome with the future MARVOR launchings, since the new software will allow a landing float to rise up to the surface soon after landing and try another dive, as many times as necessary to reach its prescribed pressure. Although that may not necessarily guaranty the success, that should help !

Table 10 gives the energy consumed, in mAh for the 7 V and 14 V packs (electonics and hydraulics plus ARGOS respectively) during each cycle at depth and during ARGOS emission at the surface. Numbers given in the table are negative and represent the consumption from the date of the preceding column. All the consumptions seem reasonable implying the floats should easily live 5 years, (except perhaps for float #113 that should be scrutinized during the next cycles)[1].

Results obtained with ALFOS #02 are mixed. On one hand this float cycled correctly every 60 days between its operational depth and the surface where it transmitted correctly the data corresponding to the 60 listening phases at depth (see Table 9). On the other hand, we were unable to recover consistent TOAs (except in the last window !) that would have allowed the acoustic positioning of the float. We have thus used this float as an ALACE proper. As explained in Appendix F, P and T calibrations done in IFREMER one year after those done in WHOI didn't give the same results. The pressure measurements apparently exhibited large fluctuations, during IFREMER tests. Furthermore, temperature data from the first 9 cycles in the Brazil basin do show a recurrent value (at 3.93 °C) for which we have no explanation. It is thus difficult, to choose between the WHOI calibration coefficients (giving float pressures between 900 and 1000 dbar) and the IFREMER ones (giving float pressures between 1000 and 1100 dbar), since the temperature values are not much reliable. We have finally chosen WHOI pressure calibration, almost at random !

Remembering the sudden depth variations experienced by some MARVORs, no such variations are seen on the ALACE pressure time series over the first six cycles. There is rather a regular deepening, probably due to creeping of the aluminum case. However near the end of cycles 7, 8 and 9, the ALFOS shows an accelerating deepening, that is thought to be caused by corrosion (recall that this ALFOS is not anodized), that could cause finally its death !

VCM results are nice, although we had big trouble to retrieve them. The float clock exhibited 1 min jumps at random, fortunately always in the same direction (clock is getting early) and some of the TOAs were aliased back into the [0,12592] ds interval (recall TOAs are coded on 12 bits and the basic interval is 0.30754445 s). Vertical displacement shows a continuous and strong upwelling (1600 m over 540 days) which seems very unrealistic and is probably due to a nonlinear rectification of the float motions (see also Section 4.4.1). As for the ALFOS #02, our (atmospheric pressure) ballasting was not too good since the float reached ~ 880 dbar instead of 800 dbar. Then it gradually sank to 1000 dbar over its 540-day lifetime, which is probably due to creeping and/or corrosion.

1. A note of caution is necessary there. The energy consumptions are not exactly measured but are estimated from elementary actions performed by MARVOR, (for each of which there corresponds a mean and constant consumption).

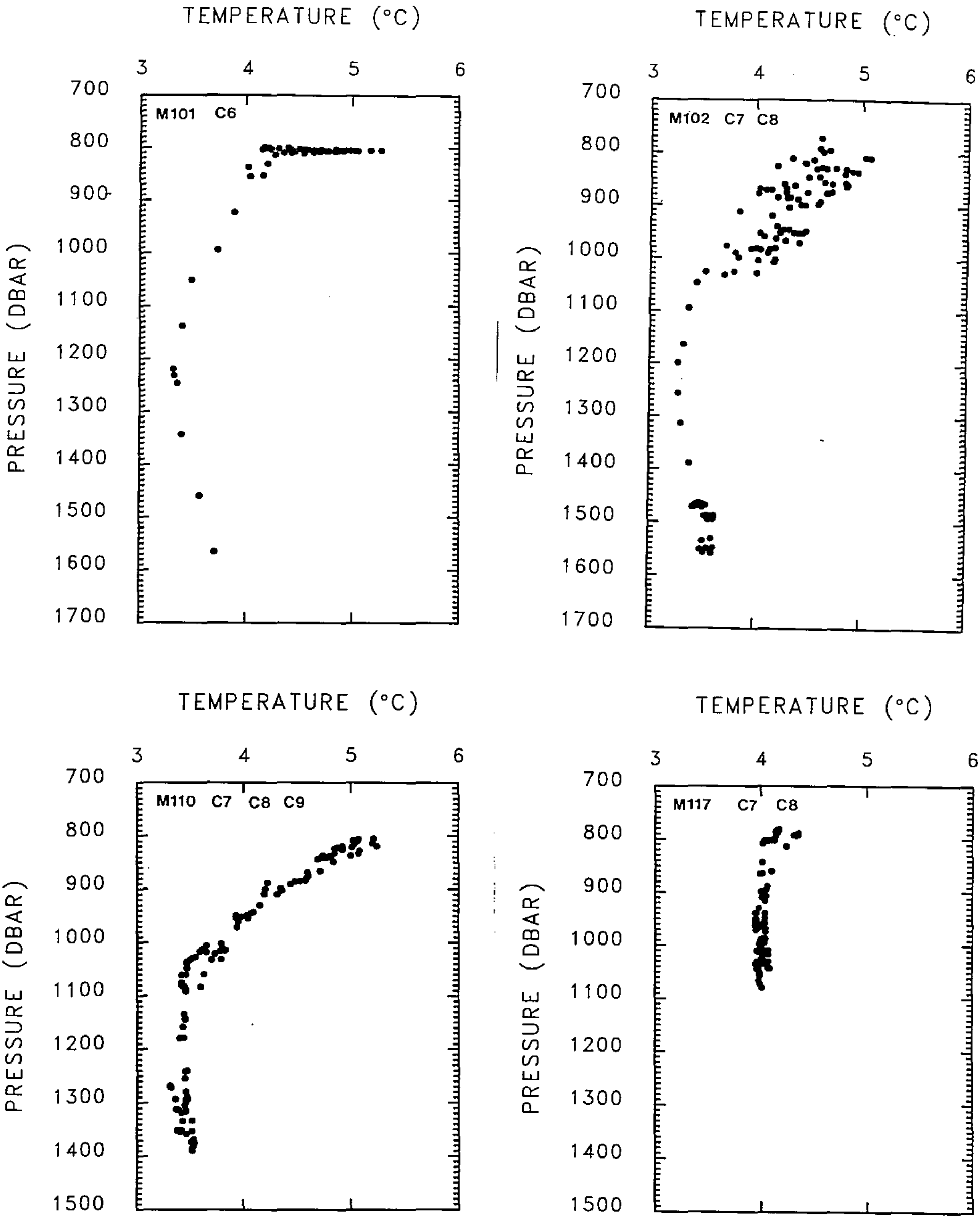


Figure 18 P-T curves from MARVOR #101, MARVOR #102, MARVOR #110 and MARVOR #117 and cycles during which floats sunk to abnormal depths.

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Table 10 MARVOR energy level statistics

MARVOR serial #		initial level	cycle 1 at surface		cycle 2 at surface		cycle 3 at surface		cycle 4 at surface		cycle 5 at surface		cycle 6 at surface		final level
			begin	end	begin	end	begin	end	begin	end	begin	end	begin	end	
101	7 V pack (mAh)	63546	-1146	-128	-1088	-64	-1088	-128	-1024	-64	-1088	-64	-1088	-128	56448
	14 V pack (mAh)	38749	-413	-512	-640	-512	-640	-832	-320	-512	-576	-576	-576	-1024	31616
102	7 V pack (mAh)	63524	-1188	-64	-1152	0	-1152	-64	-1088	0	-1088	-64	-1088	-128	56448
	14 V pack (mAh)	38541	-397	-576	-640	-512	-640	-768	-384	-512	-576	-576	-576	-576	31808
103	7 V pack (mAh)	64960	-4160	-128	-1088	-64	-1088	-64	-1088	0	-1088	-128	-1024	-64	54976
	14 V pack (mAh)	39950	-3854	-832	-320	-576	-576	-576	-576	-512	-576	-832	-320	-576	29824
104	7 V pack (mAh)	63187	-1235	-64	-1152	0	-1152	-64	-1088	0	-1152	0	-1088	-128	56064
	14 V pack (mAh)	38062	-430	-576	-576	-576	-576	-832	-320	-576	-640	-512	-576	-576	31296
105	7 V pack (mAh)	63605	-1205	-128	-1088	-64	-1088	-128	-1024	-64	-1088	-64	-1088	-64	56512
	14 V pack (mAh)	38873	-409	-576	-576	-512	-640	-768	-320	-512	-640	-512	-576	-576	32256
106	7 V pack (mAh)	64952	-1720	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	-1152	-64	57344
	14 V pack (mAh)	39828	-980	-512	-640	-512	-640	-512	-640	-576	-576	-512	-640	-576	32512
107	7 V pack (mAh)	60663	-1207	-64	-1088	0	-1152	0	-1088	-64	-1088	-64	-1088	-64	53696
	14 V pack (mAh)	37904	-400	-576	-576	-576	-640	-512	-640	-512	-640	-576	-640	-512	31104
108	7 V pack (mAh)	62837	-1269	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	55744
	14 V pack (mAh)	37825	-449	-512	-576	-512	-640	-512	-576	-512	-576	-576	-576	-512	31296

Table 10 MARVOR energy level statistics

MARVOR serial #		initial level	cycle 1 at surface		cycle 2 at surface		cycle 3 at surface		cycle 4 at surface		cycle 5 at surface		cycle 6 at surface		final level
			begin	end	begin	end	begin	end	begin	end	begin	end	begin	end	
109	7 V pack (mAh)	63505	-1361	0	-1152	0	-1152	0	-1152	0	-1152	-64	-1088	-64	56320
	14 V pack (mAh)	38224	-528	-512	-640	-512	-640	-512	-576	-512	-640	-512	-576	-576	31488
110	7 V pack (mAh)	63499	-1227	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	56448
	14 V pack (mAh)	38518	-374	-512	-640	-512	-576	-576	-576	-512	-576	-576	-576	-512	32000
111	7 V pack (mAh)	63561	-1161	-64	-1088	-64	-1088	-64	-1088	-64	-1152	-64	-1088	-64	56512
	14 V pack (mAh)	38570	-362	-512	-640	-512	-640	-512	-640	-512	-640	-512	-640	-832	31616
112	7 V pack (mAh)	63149	-1197	0	-1152	-64	-1088	0	-1152	0	-1152	-64	-1088	-64	56128
	14 V pack (mAh)	38694	-422	-512	-576	-512	-640	-512	-640	-512	-640	-512	-576	-512	32128
113	7 V pack (mAh)	63617	-1217	-64	-1088	-64	-1088	-64	-1088	-64	-1152	-64	-1088	-64	56512
	14 V pack (mAh)	38833	-433	-512	-640	-512	-640	-512	-640	-512	-576	-512	-640	-832	31872
114	7 V pack (mAh)	61716	-1172	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	54720
	14 V pack (mAh)	38441	-361	-512	-640	-512	-640	-512	-576	-512	-640	-512	-640	-512	31872
115	7 V pack (mAh)	63513	-1177	-64	-1088	-64	-1088	-64	-1088	-64	-1152	0	-1152	0	56512
	14 V pack (mAh)	38220	-460	-512	-704	-512	-640	-512	-640	-448	-704	-512	-576	-512	31488
116	7 V pack (mAh)	63618	-1218	0	-1152	-64	-1088	-64	-1088	-64	-1088	-64	-1088	-64	56576
	14 V pack (mAh)	38466	-386	-576	-640	-512	-640	-576	-640	-512	-640	-576	-576	-576	31616

Table 10 MARVOR energy level statistics

MARVOR serial #		initial level	cycle 1 at surface		cycle 2 at surface		cycle 3 at surface		cycle 4 at surface		cycle 5 at surface		cycle 6 at surface		final level
			begin	end	begin	end	begin	end	begin	end	begin	end	begin	end	
117	7 V pack (mAh)	63623	-1287	0	-1152	0	-1152	0	-1152	-64	-1088	-64	-1088	-64	56512
	14 V pack (mAh)	38470	-518	-512	-640	-576	-640	-512	-640	-576	-640	-576	-640	-512	31488
118	7 V pack (mAh)	63747	-1539	-64	-1088	-64	-1152	-64	-1088	-64	-1088	0	-1152	-64	56320
	14 V pack (mAh)	39052	-588	-512	-576	-576	-576	-512	-640	-512	-576	-512	-576	-832	32064
119	7 V pack (mAh)	63641	-1177	-64	-1152	0	-1152	0	-1152	-64	-1088	-64	-1088	-64	56576
	14 V pack (mAh)	38529	-513	-512	-640	-512	-640	-512	-640	-512	-640	-512	-640	-512	31744
120	7 V pack (mAh)	63361	-1217	0	-1152	0	-1152	0	-1152	-64	-1088	-64	-1088	-64	56320
	14 V pack (mAh)	38330	-378	-512	-640	-512	-576	-576	-640	-512	-576	-576	-576	-512	31744

MARVOR serial #		initial level	cycle 7 at surface		cycle 8 at surface		cycle 9 at surface		final level
			begin	end	begin	end	begin	end	
101	7 V pack (mAh)	56448	-1024	-64	-1088	-64	-1024	-64	53120
	14 V pack (mAh)	31616	-320	-512	-576	-512	-576	-512	28608
102	7 V pack (mAh)	56448	-1088	-64	-1024	-64	-1088	0	53120
	14 V pack (mAh)	31808	-640	-1024	-320	-576	-576	-512	28160
103	7 V pack (mAh)	54976							54976
	14 V pack (mAh)	29824							29824
104	7 V pack (mAh)	56064	-1088	-64	-1024	-64	-1088	-64	52672
	14 V pack (mAh)	31296	-576	-896	-256	-576	-576	-896	27520
105	7 V pack (mAh)	56512	-1088	-64	-1088	0	-1088	-64	53120
	14 V pack (mAh)	32256	-576	-832	-320	-512	-576	-576	28864
106	7 V pack (mAh)	57344	-1088	-64	-1024	-64	-1088	-64	53952
	14 V pack (mAh)	32512	-576	-832	-320	-512	-640	-512	29120
107	7 V pack (mAh)	53696	-1088	-64	-1024	-64	-1024	-128	50304
	14 V pack (mAh)	31104	-640	-832	-256	-896	-320	-832	27328
108	7 V pack (mAh)	55744	-1088	-64	-1088	-64			53440
	14 V pack (mAh)	31296	-576	-512	-576	-832			28800

MARVOR serial #		initial level	cycle 7 at surface		cycle 8 at surface		cycle 9 at surface		final level
			begin	end	begin	end	begin	end	
109	7 V pack (mAh)	56320	-1088	0	-1088	-64	-1088	0	52992
	14 V pack (mAh)	31488	-576	-512	-576	-576	-576	-512	28160
110	7 V pack (mAh)	56448	-1088	-64	-1088	-64	-1024	-64	53056
	14 V pack (mAh)	32000	-640	-960	-384	-832	-320	-1088	27776
111	7 V pack (mAh)	56512	-1024	-128	-1024	-64	-1088	-128	53056
	14 V pack (mAh)	31616	-320	-832	-256	-832	-320	-832	28224
112	7 V pack (mAh)	56128	-1088	0	-1088	-64	-1088	0	52800
	14 V pack (mAh)	32128	-640	-512	-576	-512	-640	-512	28736
113	7 V pack (mAh)	56512	-1024	-128	-1024	-64	-1088	-128	53056
	14 V pack (mAh)	31872	-256	-1664	-384	-1536	-320	-1664	26048
114	7 V pack (mAh)	54720	-1024	-128	-1024	-64	-1024	-64	51392
	14 V pack (mAh)	31872	-576	-832	-256	-512	-576	-512	28608
115	7 V pack (mAh)	56512	-1088	-64	-1088	-64	-1024	-64	53120
	14 V pack (mAh)	31488	-640	-512	-640	-832	-320	-512	28032
116	7 V pack (mAh)	56576	-1088	-64	-1088	-64	-1024	-64	53184
	14 V pack (mAh)	31616	-576	-576	-640	-768	-320	-512	28224

MARVOR serial #		initial level	cycle 7 at surface		cycle 8 at surface		cycle 9 at surface		final level
			begin	end	begin	end	begin	end	
117	7 V pack (mAh)	56512	-1088	0	-1088	-128	-1024	-128	53056
	14 V pack (mAh)	31488	-640	-576	-640	-832	-320	-896	27584
118	7 V pack (mAh)	56320	-1024	-64	-1088	-64	-1088	-64	52928
	14 V pack (mAh)	32064	-320	-512	-640	-512	-576	-832	28672
119	7 V pack (mAh)	56576	-1088	0	-1088	-128	-1024	-128	53120
	14 V pack (mAh)	31744	-640	-512	-640	-832	-256	-832	28032
120	7 V pack (mAh)	56320	-1088	0	-1088	-128	-1024	-64	52928
	14 V pack (mAh)	31744	-576	-576	-576	-896	-256	-512	28352

4.8 General circulation of AAIW in the Brazil basin

After one year, the 10 floats launched south of the Vitoria-Trindade seamount chain (which stretches eastward along ≈21°S) show clearly a mean westward motion associated with the northwestern limb of the subtropical gyre. At 800 dbar, this large anticyclonic gyre, as revealed by hydrography, spans the entire South Atlantic between 45°S and 25°S (Reid, 1989, 1994). A little more south than our floats, above the Rio Grande rise near 30°S, 10 RAFOS trajectories of 3 to 6-month duration (W. Zenk, personal communication) have also shown a mean westward motion, in agreement with Reid's scheme. A few ALACEs drifting eastward around 40° are to two years after their launching in January 1990 in the Drake passage, (Davis, 1989, 1994) were also probably taken in this gyre but at its southern limb (Fig. 19).

The 10 floats (9 MARVORs and 1 ALFOS) launched north of the Vitoria-Trindade chain, in 2 clusters reveal rather a mesoscale dispersion and only weak motions for the cluster barycenters.

The most striking feature is of course the strong IWBC revealed from 25°S quasi-continuously to 2°S. One MARVOR and the VCM were deliberately seeded in this presumed boundary current near Salvador da Bahia in February 1994. These floats were entrained northward at speed of the order of 0.5 knot, for one month, paralleling the underneath bathymetry. Then they were detrained from the western boundary, the MARVOR penetrating as a meandering jet in the interior where it stayed wandering "isotropically" over 8 months while the VCM wandered more zonally in the large scale. 3 floats from the 2 southern clusters and 1 float from the third cluster (launched around 19°S) were also entrained after a few cycles within the western boundary current. They then followed rather well the topographic contours, except for some recirculations that may compensate partly the volume flux associated with the boundary current. These recirculations also give an order of magnitude for the IWBC width, which is of a few tens of km.

One float managed to find its way through the tiny westernmost passage in the Vitoria-Trindade chain near 20°S, 38°W, while the float from the third cluster reached after one year the exact launch position of the 2 "Salvador floats" !

This shows the quasi-continuity of the IWBC and proves that AAIW from the subtropical gyre is advected within the boundary current, to the north (at least 2°S, as given by our floats).

On the contrary, 2 floats of the southernmost cluster have continued their way southwestward. They were not entrained within a northeastward IWBC. They will probably follow a path bringing them into the confluence region between 40°S and 50°S. They could then be entrained eastward like the ALACEs deployed in Drake passage and found one year later in the confluence zone for at least four of them.

Looking closely at the bathymetric contours, there seems to be a divergence for the float trajectories around 28°S, 42°W, on the approximate axis of the Rio Grande Rise. To what extend this is a stationary feature or simply a mere coincidence cannot be answered now. Much more data will be needed.

The western boundary region excluded, the float large-scale dispersion appears mainly zonal. This could not be too great a surprise since the large scale mean general circulation is itself mainly zonal in the interior. But what is the mean circulation for the 2 northern clusters ? Presumably, we do need several years of data to resolve the mean circulation. One year and a half shows only the mixing processes !

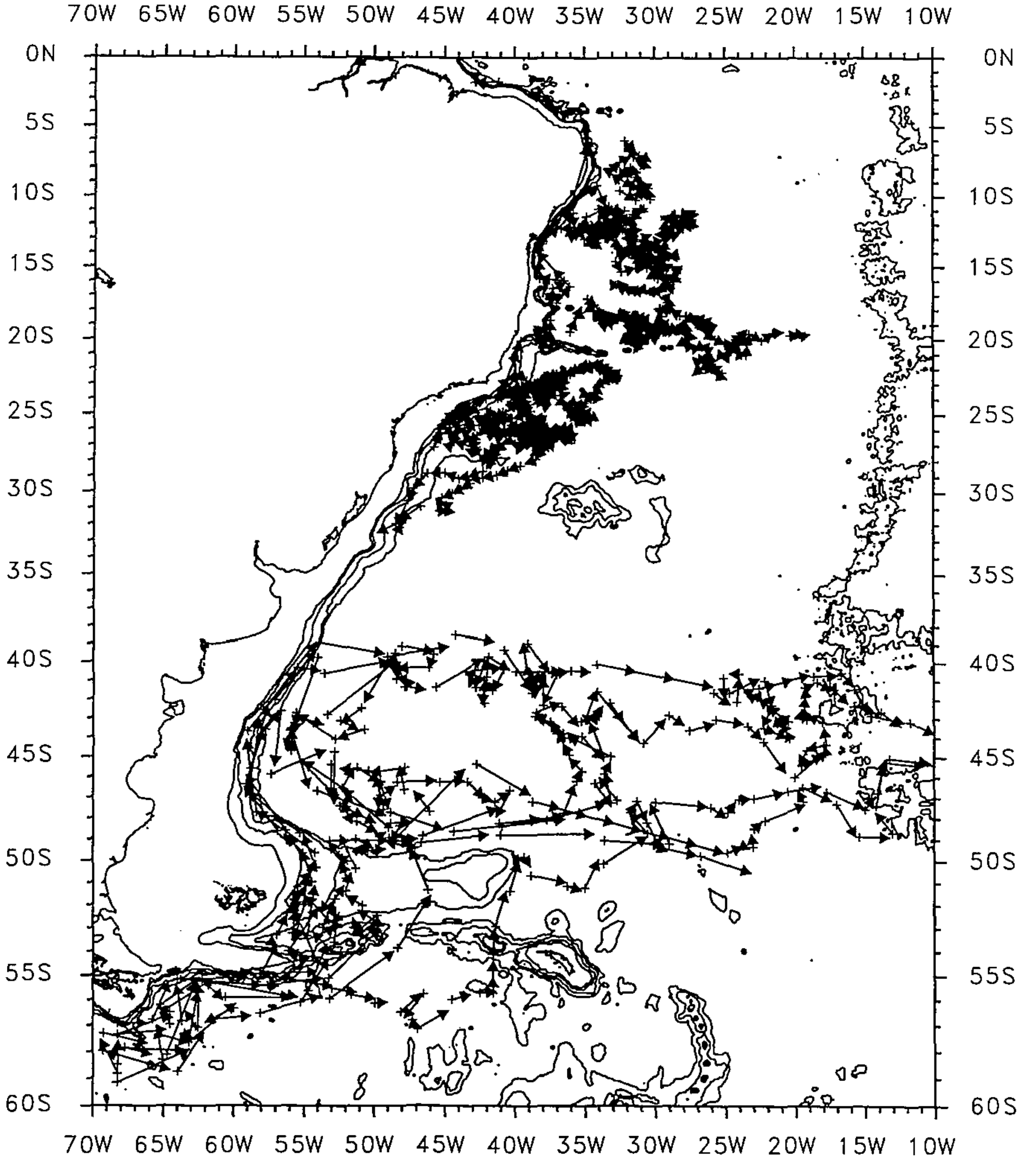


Figure 19 15-day displacement vectors at 800 dbar from the 20 SAMBA1 MARVORs and the VCM (in the tropical Brazil basin) and the 8 ALACE floats (in the Drake passage and downstream; Davis personal communication).

Appendices

Appendix A FLOATER format for the SAMBA lagrangian data

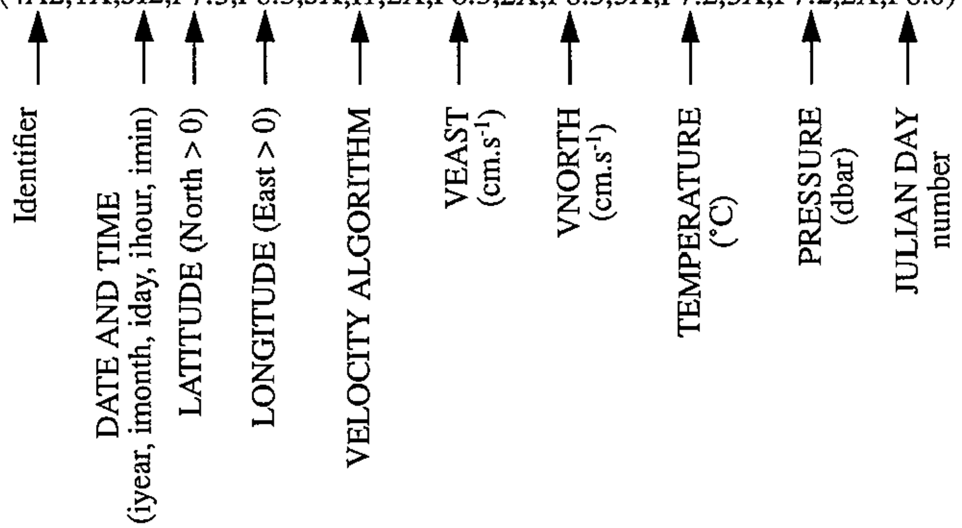
The following is a description of the format used to store data from the SAMBA subsurface floats. The records are 90 characters long and are stored in an alphanumeric (ASCII) format. This format was designed by P.Richardson (WHOI) for ease of editing, manual inspection of data, and transportability to other users and installations (in the general WHOI FLOATER format, the records may be variable length).

Field	Position	Description
IDENTIFIER	001-008	Experiment and buoy identifier; character. This field contains a eight-character identifier, left-justified in the field and not containing any embedded blanks. Trailing blanks are acceptable.
DATE	010-015	Date; integer.
iyear	010-011	This field contains the date of the data observation (year/
imonth	012-013	month/day). Only the last two digits of the year are used. Thus
iday	014-015	October 4,1981 is stored as 811004. The zero is significant as a place holder.
TIME	016-019	Time; integer.
ihour	016-017	This field contains the time of the data observation (UT). The
iminute	018-019	time is stored as an hour component, taken from 00 to 24 hours, plus the minutes. Thus, 3:08 p.m. is stored as 1508. The zero is significant as a place holder.
LATITUDE	020-026	Latitude, degrees positive for North; real (F7.3). This field contains the latitude position of the float at the time of the data observation.
LONGITUDE	027-034	Longitude, degrees positive for East; real (F8.3). This field contains the longitude position of the float at the time of the data observation.
VELOCITY	040	Velocity algorithm. 1 - backward differencing. 2 - forward differencing. 3 - splined. 4 - Chebyshev. 5 - averaged.
VEAST	041-050	East component of water velocity, cm/sec; real (F8.3). This and the following field are reserved for storage of the water-velocity components. The velocity may be computed in any of a variety of ways; the method used is encoded in the appropriate validity field. A westerly direction of the velocity is negative.

Field	Position	Description
VNORTH	051-060	North component of water velocity, cm/sec; real (F8.3). Velocities to the South are considered negative.
TEMPERATURE	066-070	In-situ temperature in °C measured by the float and at float depth; real (F5.2).
PRESSURE	074-080	Pressure in dbar at the float depth (generally measured by the float); real (F7.2).
JULIAN DAY	083-090	Julian day number corresponding to the gregorian date given in field n°2 above; real (F8.0). Note however that here Julian days are considered to begin at 0h UT, although exact Julian days should begin at 12h UT (see Appendix B).

In summary FLOATER format used for SAMBA lagrangian data is:

(4A2,1X,5I2,F7.3,F8.3,5X,I1,2X,F8.3,2X,F8.3,3X,F7.2,3X,F7.2,2X,F8.0)



For a missing field value (except the identifier, date and time and Julian day number), we have: latitude = -99.; longitude = -999.; pressure = -999. (or -99.); temperature = -999. (or -99. or 99.); velocity algorithm = 0; VEAST = -999.; VNORTH = -999.

Appendix B Calendars and time

In ordinary life we refer dates to the Gregorian calendar. Although Gregorian dates are used in this report on occasion, generally raw data use one or another of the following day numbering:

Julian Date (JD) is the number of days elapsed since January 1st 4713 BC at 12h UT (thus on January 1st 1983 at 12h UT begins Julian Day number 2445336).

Modified Julian Date (MJD) is the number of day elapsed since November 17th 1858 AD at 0h UT (thus on January 1st 1983 at 0h UT begins Modified Julian Day number 45335).
Note that MJD is given by JD-2400000.5 and that an integral MJD corresponds to 0h UT while an integral JD corresponds to 12h UT.

Some authors also use Truncated Modified Julian Date (TMJD) by using only the four or three least significant digits of a MJD (e.g. TMJD number 5335 or 335 corresponds to MJD number 45335).

We have found useful to define a Julian date referred to 1950 (here after called 1950JD) as the number of days elapsed since December 31st 1949 at 0h UT (thus 1950JD number 1 begins on January 1st 1983 at 0h UT). Note that CLS/ARGOS used for many years a similar dating but CLS/ARGOS number 1 was corresponding instead to January 2nd 1950.
Caution: In the float files dates are given both in the gregorian calendar with years truncated to the two least significant digits (e.g. 1983 becomes 83) and in Julian Days, but referred to 0h UT and not to 12h UT as in the formal definition (thus for example, in the float data files, 2445701 corresponds to January 1st 1984).

Time is always given in Universal Time (UT). UT is the mean solar time at Greenwich+12h. In fact, we should consider UTC (Universal Time Coordinated) which is exactly equal to Atomic Time or «Temps Atomique International» (TAI), except for 1s jumps (or leap seconds) occuring generally once a year, so that UTC doesn't deviate from UT1 by more than 0.9s[1]. When we check the time of the clocks of the floats or of the sound source we do it by comparison with UTC.

Table B1 gives the deviations between UTC and TAI.

Table B1 Deviations between UTC and TAI

	DELTA (s) = UTC - TAI
from 01/07/1982 to 01/07/1983	-21
from 01/07/1983 to 01/07/1985	-22
from 01/07/1985 to 01/01/1988	-23
from 01/01/1988 to 01/01/1990	-24
from 01/01/1990 to 01/01/1991	-25
from 01/01/1991 to 01/07/1992	-26
from 01/07/1992 to 01/07/1993	-27
from 01/07/1993 to 01/07/1994	-28
from 01/07/1994 to ...	-29

Readers interested in calendars and time can consult Ephémérides astronomiques 1993 (Gau-

1.UT1 reflects the variable rotation of the earth, since it is based on star transits at the Greenwich meridian. UT1 is corrected for the polar motion (UT0 is not).

thier-Villards, 1993) or directly the Bureau International de l'Heure, BIPM, Pavillon de Breteuil, 12 bis grande rue, 92310 Sèvres CEDEX Tel: (33) 45/07/70/70.

Table B2 gives corresponding dates (1950JD, Gregorian date, JD and MJD) for every January 1st at 0h UT, between 1950 and 2000. A complete calendar for years 1992 to 1999 is also included (Table B3).

Table B2 Corresponding dates for January 1st at 0h UT, between 1950 and 2000 AD

In this table, all dates refer to 0h UT

1950 JD	Gregorian date	JD	MJD	year type
1	1/01/1950	2433282.5	33282	
366	1/01/1951	2433647.5	33647	
731	1/01/1952	2434012.5	34012	leap
1097	1/01/1953	2434378.5	34378	
1462	1/01/1954	2434743.5	34743	
1827	1/01/1955	2435108.5	35108	
2192	1/01/1956	2435473.5	35473	leap
2558	1/01/1957	2435839.5	35839	
2923	1/01/1958	2436204.5	36204	
3288	1/01/1959	2436569.5	36569	
3653	1/01/1960	2436934.5	36934	leap
4019	1/01/1961	2437300.5	37300	
4384	1/01/1962	2437665.5	37665	
4749	1/01/1963	2438030.5	38030	
5114	1/01/1964	2438395.5	38395	leap
5480	1/01/1965	2438761.5	38761	
5845	1/01/1966	2439126.5	39126	
6210	1/01/1967	2439491.5	39491	
6575	1/01/1968	2439856.5	39856	leap
6941	1/01/1969	2440222.5	40222	
7306	1/01/1970	2440587.5	40587	
7671	1/01/1971	2440952.5	40952	
8036	1/01/1972	2441317.5	41317	leap
8402	1/01/1973	2441683.5	41683	
8767	1/01/1974	2442048.5	2048	
9132	1/01/1975	2442413.5	42413	
9497	1/01/1976	2442778.5	42778	leap
9863	1/01/1977	2443144.5	43144	

Table B2 Corresponding dates for January 1st at 0h UT, between 1950 and 2000 AD

In this table, all dates refer to 0h UT

1950 JD	Gregorian date	JD	MJD	year type
10228	1/01/1978	2443509.5	43509	
10593	1/01/1979	2443874.5	43874	
10958	1/01/1980	2444239.5	44239	leap
11324	1/01/1981	2444605.5	44605	
11689	1/01/1982	2444970.5	44970	
12054	1/01/1983	2445335.5	45335	
12419	1/01/1984	2445700.5	45700	leap
12785	1/01/1985	2446066.5	46066	
13150	1/01/1986	2446431.5	46431	
13515	1/01/1987	2446796.5	46796	
13880	1/01/1988	2447161.5	47161	leap
14246	1/01/1989	2447527.5	47527	
14611	1/01/1990	2447892.5	47892	
14976	1/01/1991	2448257.5	48257	
15341	1/01/1992	2448622.5	48622	leap
15707	1/01/1993	2448988.5	48988	
16072	1/01/1994	2449353.5	49353	
16437	1/01/1995	2449718.5	49718	
16802	1/01/1996	2450083.5	50083	leap
17168	1/01/1997	2450449.5	50449	
17533	1/01/1998	2450814.5	50814	
17898	1/01/1999	2451179.5	51179	
18263	1/01/2000	2451544.5	51544	leap

Table B3 Calendar for the year 1994

CALENDAR

All dates are referred to 0h UT.
We find successively:
Julian day.
Modified Julian day.
1950 Julian day.
number of the day in the year.
gregorian date (day,month,year).

Recall:
Julian day number 0 begins at 12h UT on january 1st 4713 BC.
Modified Julian day number 0 begins at 0h UT on november 17th 1858 AD.
1950 Julian day number 1 begins at 0h UT on january 1st 1950 AD.

2449353.5	2449354.5	2449355.5	2449356.5	2449357.5	2449358.5	2449359.5	2449360.5	2449361.5	2449362.5
49353.	49354.	49355.	49356.	49357.	49358.	49359.	49360.	49361.	49362.
16072	16073	16074	16075	16076	16077	16078	16079	16080	16081
1	2	3	4	5	6	7	8	9	10
1/ 1/1994	2/ 1/1994	3/ 1/1994	4/ 1/1994	5/ 1/1994	6/ 1/1994	7/ 1/1994	8/ 1/1994	9/ 1/1994	10/ 1/1994

2449363.5	2449364.5	2449365.5	2449366.5	2449367.5	2449368.5	2449369.5	2449370.5	2449371.5	2449372.5
49363.	49364.	49365.	49366.	49367.	49368.	49369.	49370.	49371.	49372.
16082	16083	16084	16085	16086	16087	16088	16089	16090	16091
11	12	13	14	15	16	17	18	19	20
11/ 1/1994	12/ 1/1994	13/ 1/1994	14/ 1/1994	15/ 1/1994	16/ 1/1994	17/ 1/1994	18/ 1/1994	19/ 1/1994	20/ 1/1994

2449373.5	2449374.5	2449375.5	2449376.5	2449377.5	2449378.5	2449379.5	2449380.5	2449381.5	2449382.5
49373.	49374.	49375.	49376.	49377.	49378.	49379.	49380.	49381.	49382.
16092	16093	16094	16095	16096	16097	16098	16099	16100	16101
21	22	23	24	25	26	27	28	29	30
21/ 1/1994	22/ 1/1994	23/ 1/1994	24/ 1/1994	25/ 1/1994	26/ 1/1994	27/ 1/1994	28/ 1/1994	29/ 1/1994	30/ 1/1994

2449383.5	2449384.5	2449385.5	2449386.5	2449387.5	2449388.5	2449389.5	2449390.5	2449391.5	2449392.5
49383.	49384.	49385.	49386.	49387.	49388.	49389.	49390.	49391.	49392.
16102	16103	16104	16105	16106	16107	16108	16109	16110	16111
31	32	33	34	35	36	37	38	39	40
31/ 1/1994	1/ 2/1994	2/ 2/1994	3/ 2/1994	4/ 2/1994	5/ 2/1994	6/ 2/1994	7/ 2/1994	8/ 2/1994	9/ 2/1994

2449393.5	2449394.5	2449395.5	2449396.5	2449397.5	2449398.5	2449399.5	2449400.5	2449401.5	2449402.5
49393.	49394.	49395.	49396.	49397.	49398.	49399.	49400.	49401.	49402.
16112	16113	16114	16115	16116	16117	16118	16119	16120	16121
41	42	43	44	45	46	47	48	49	50
10/ 2/1994	11/ 2/1994	12/ 2/1994	13/ 2/1994	14/ 2/1994	15/ 2/1994	16/ 2/1994	17/ 2/1994	18/ 2/1994	19/ 2/1994

2449403.5	2449404.5	2449405.5	2449406.5	2449407.5	2449408.5	2449409.5	2449410.5	2449411.5	2449412.5
49403.	49404.	49405.	49406.	49407.	49408.	49409.	49410.	49411.	49412.
16122	16123	16124	16125	16126	16127	16128	16129	16130	16131
51	52	53	54	55	56	57	58	59	60
20/ 2/1994	21/ 2/1994	22/ 2/1994	23/ 2/1994	24/ 2/1994	25/ 2/1994	26/ 2/1994	27/ 2/1994	28/ 2/1994	1/ 3/1994

2449413.5	2449414.5	2449415.5	2449416.5	2449417.5	2449418.5	2449419.5	2449420.5	2449421.5	2449422.5
49413.	49414.	49415.	49416.	49417.	49418.	49419.	49420.	49421.	49422.
16132	16133	16134	16135	16136	16137	16138	16139	16140	16141
61	62	63	64	65	66	67	68	69	70
2/ 3/1994	3/ 3/1994	4/ 3/1994	5/ 3/1994	6/ 3/1994	7/ 3/1994	8/ 3/1994	9/ 3/1994	10/ 3/1994	11/ 3/1994

2449423.5	2449424.5	2449425.5	2449426.5	2449427.5	2449428.5	2449429.5	2449430.5	2449431.5	2449432.5
49423.	49424.	49425.	49426.	49427.	49428.	49429.	49430.	49431.	49432.
16142	16143	16144	16145	16146	16147	16148	16149	16150	16151
71	72	73	74	75	76	77	78	79	80
12/ 3/1994	13/ 3/1994	14/ 3/1994	15/ 3/1994	16/ 3/1994	17/ 3/1994	18/ 3/1994	19/ 3/1994	20/ 3/1994	21/ 3/1994

2449433.5	2449434.5	2449435.5	2449436.5	2449437.5	2449438.5	2449439.5	2449440.5	2449441.5	2449442.5
49433.	49434.	49435.	49436.	49437.	49438.	49439.	49440.	49441.	49442.
16152	16153	16154	16155	16156	16157	16158	16159	16160	16161
81	82	83	84	85	86	87	88	89	90
22/ 3/1994	23/ 3/1994	24/ 3/1994	25/ 3/1994	26/ 3/1994	27/ 3/1994	28/ 3/1994	29/ 3/1994	30/ 3/1994	31/ 3/1994

2449443.5	2449444.5	2449445.5	2449446.5	2449447.5	2449448.5	2449449.5	2449450.5	2449451.5	2449452.5
49443.	49444.	49445.	49446.	49447.	49448.	49449.	49450.	49451.	49452.
16162	16163	16164	16165	16166	16167	16168	16169	16170	16171
91	92	93	94	95	96	97	98	99	100
1/ 4/1994	2/ 4/1994	3/ 4/1994	4/ 4/1994	5/ 4/1994	6/ 4/1994	7/ 4/1994	8/ 4/1994	9/ 4/1994	10/ 4/1994

2449453.5	2449454.5	2449455.5	2449456.5	2449457.5	2449458.5	2449459.5	2449460.5	2449461.5	2449462.5
49453.	49454.	49455.	49456.	49457.	49458.	49459.	49460.	49461.	49462.
16172	16173	16174	16175	16176	16177	16178	16179	16180	16181
101	102	103	104	105	106	107	108	109	110
11/ 4/1994	12/ 4/1994	13/ 4/1994	14/ 4/1994	15/ 4/1994	16/ 4/1994	17/ 4/1994	18/ 4/1994	19/ 4/1994	20/ 4/1994

2449463.5	2449464.5	2449465.5	2449466.5	2449467.5	2449468.5	2449469.5	2449470.5	2449471.5	2449472.5
49463.	49464.	49465.	49466.	49467.	49468.	49469.	49470.	49471.	49472.
16182	16183	16184	16185	16186	16187	16188	16189	16190	16191
111	112	113	114	115	116	117	118	119	120
21/ 4/1994	22/ 4/1994	23/ 4/1994	24/ 4/1994	25/ 4/1994	26/ 4/1994	27/ 4/1994	28/ 4/1994	29/ 4/1994	30/ 4/1994

2449473.5	2449474.5	2449475.5	2449476.5	2449477.5	2449478.5	2449479.5	2449480.5	2449481.5	2449482.5
49473.	49474.	49475.	49476.	49477.	49478.	49479.	49480.	49481.	49482.
16192	16193	16194	16195	16196	16197	16198	16199	16200	16201
121	122	123	124	125	126	127	128	129	130
1/ 5/1994	2/ 5/1994	3/ 5/1994	4/ 5/1994	5/ 5/1994	6/ 5/1994	7/ 5/1994	8/ 5/1994	9/ 5/1994	10/ 5/1994

2449483.5	2449484.5	2449485.5	2449486.5	2449487.5	2449488.5	2449489.5	2449490.5	2449491.5	2449492.5
49483.	49484.	49485.	49486.	49487.	49488.	49489.	49490.	49491.	49492.
16202	16203	16204	16205	16206	16207	16208	16209	16210	16211
131	132	133	134	135	136	137	138	139	140
11/ 5/1994	12/ 5/1994	13/ 5/1994	14/ 5/1994	15/ 5/1994	16/ 5/1994	17/ 5/1994	18/ 5/1994	19/ 5/1994	20/ 5/1994

2449493.5	2449494.5	2449495.5	2449496.5	2449497.5	2449498.5	2449499.5	2449500.5	2449501.5	2449502.5
49493.	49494.	49495.	49496.	49497.	49498.	49499.	49500.	49501.	49502.
16212	16213	16214	16215	16216	16217	16218	16219	16220	16221
141	142	143	144	145	146	147	148	149	150
21/ 5/1994	22/ 5/1994	23/ 5/1994	24/ 5/1994	25/ 5/1994	26/ 5/1994	27/ 5/1994	28/ 5/1994	29/ 5/1994	30/ 5/1994

2449503.5	2449504.5	2449505.5	2449506.5	2449507.5	2449508.5	2449509.5	2449510.5	2449511.5	2449512.5
49503.	49504.	49505.	49506.	49507.	49508.	49509.	49510.	49511.	49512.
16222	16223	16224	16225	16226	16227	16228	16229	16230	16231
151	152	153	154	155	156	157	158	159	160
31/ 5/1994	1/ 6/1994	2/ 6/1994	3/ 6/1994	4/ 6/1994	5/ 6/1994	6/ 6/1994	7/ 6/1994	8/ 6/1994	9/ 6/1994

2449513.5	2449514.5	2449515.5	2449516.5	2449517.5	2449518.5	2449519.5	2449520.5	2449521.5	2449522.5
49513.	49514.	49515.	49516.	49517.	49518.	49519.	49520.	49521.	49522.
16232	16233	16234	16235	16236	16237	16238	16239	16240	16241
161	162	163	164	165	166	167	168	169	170
10/ 6/1994	11/ 6/1994	12/ 6/1994	13/ 6/1994	14/ 6/1994	15/ 6/1994	16/ 6/1994	17/ 6/1994	18/ 6/1994	19/ 6/1994

2449523.5	2449524.5	2449525.5	2449526.5	2449527.5	2449528.5	2449529.5	2449530.5	2449531.5	2449532.5
49523.	49524.	49525.	49526.	49527.	49528.	49529.	49530.	49531.	49532.
16242	16243	16244	16245	16246	16247	16248	16249	16250	16251
171	172	173	174	175	176	177	178	179	180
20/ 6/1994	21/ 6/1994	22/ 6/1994	23/ 6/1994	24/ 6/1994	25/ 6/1994	26/ 6/1994	27/ 6/1994	28/ 6/1994	29/ 6/1994

2449533.5	2449534.5	2449535.5	2449536.5	2449537.5	2449538.5	2449539.5	2449540.5	2449541.5	2449542.5
49533.	49534.	49535.	49536.	49537.	49538.	49539.	49540.	49541.	49542.
16252	16253	16254	16255	16256	16257	16258	16259	16260	16261
181	182	183	184	185	186	187	188	189	190
30/ 6/1994	1/ 7/1994	2/ 7/1994	3/ 7/1994	4/ 7/1994	5/ 7/1994	6/ 7/1994	7/ 7/1994	8/ 7/1994	9/ 7/1994

2449543.5	2449544.5	2449545.5	2449546.5	2449547.5	2449548.5	2449549.5	2449550.5	2449551.5	2449552.5
49543.	49544.	49545.	49546.	49547.	49548.	49549.	49550.	49551.	49552.
16262	16263	16264	16265	16266	16267	16268	16269	16270	16271
191	192	193	194	195	196	197	198	199	200
10/ 7/1994	11/ 7/1994	12/ 7/1994	13/ 7/1994	14/ 7/1994	15/ 7/1994	16/ 7/1994	17/ 7/1994	18/ 7/1994	19/ 7/1994

2449553.5	2449554.5	2449555.5	2449556.5	2449557.5	2449558.5	2449559.5	2449560.5	2449561.5	2449562.5
49553.	49554.	49555.	49556.	49557.	49558.	49559.	49560.	49561.	49562.
16272	16273	16274	16275	16276	16277	16278	16279	16280	16281
201	202	203	204	205	206	207	208	209	210
20/ 7/1994	21/ 7/1994	22/ 7/1994	23/ 7/1994	24/ 7/1994	25/ 7/1994	26/ 7/1994	27/ 7/1994	28/ 7/1994	29/ 7/1994

2449563.5	2449564.5	2449565.5	2449566.5	2449567.5	2449568.5	2449569.5	2449570.5	2449571.5	2449572.5
49563.	49564.	49565.	49566.	49567.	49568.	49569.	49570.	49571.	49572.
16282	16283	16284	16285	16286	16287	16288	16289	16290	16291
211	212	213	214	215	216	217	218	219	220
30/ 7/1994	31/ 7/1994	1/ 8/1994	2/ 8/1994	3/ 8/1994	4/ 8/1994	5/ 8/1994	6/ 8/1994	7/ 8/1994	8/ 8/1994

2449573.5	2449574.5	2449575.5	2449576.5	2449577.5	2449578.5	2449579.5	2449580.5	2449581.5	2449582.5
49573.	49574.	49575.	49576.	49577.	49578.	49579.	49580.	49581.	49582.
16292	16293	16294	16295	16296	16297	16298	16299	16300	16301
221	222	223	224	225	226	227	228	229	230
9/ 8/1994	10/ 8/1994	11/ 8/1994	12/ 8/1994	13/ 8/1994	14/ 8/1994	15/ 8/1994	16/ 8/1994	17/ 8/1994	18/ 8/1994

2449583.5	2449584.5	2449585.5	2449586.5	2449587.5	2449588.5	2449589.5	2449590.5	2449591.5	2449592.5
49583.	49584.	49585.	49586.	49587.	49588.	49589.	49590.	49591.	49592.
16302	16303	16304	16305	16306	16307	16308	16309	16310	16311
231	232	233	234	235	236	237	238	239	240
19/ 8/1994	20/ 8/1994	21/ 8/1994	22/ 8/1994	23/ 8/1994	24/ 8/1994	25/ 8/1994	26/ 8/1994	27/ 8/1994	28/ 8/1994

2449593.5	2449594.5	2449595.5	2449596.5	2449597.5	2449598.5	2449599.5	2449600.5	2449601.5	2449602.5
49593.	49594.	49595.	49596.	49597.	49598.	49599.	49600.	49601.	49602.
16312	16313	16314	16315	16316	16317	16318	16319	16320	16321
241	242	243	244	245	246	247	248	249	250
29/ 8/1994	30/ 8/1994	31/ 8/1994	1/ 9/1994	2/ 9/1994	3/ 9/1994	4/ 9/1994	5/ 9/1994	6/ 9/1994	7/ 9/1994

2449603.5	2449604.5	2449605.5	2449606.5	2449607.5	2449608.5	2449609.5	2449610.5	2449611.5	2449612.5
49603.	49604.	49605.	49606.	49607.	49608.	49609.	49610.	49611.	49612.
16322	16323	16324	16325	16326	16327	16328	16329	16330	16331
251	252	253	254	255	256	257	258	259	260
8/ 9/1994	9/ 9/1994	10/ 9/1994	11/ 9/1994	12/ 9/1994	13/ 9/1994	14/ 9/1994	15/ 9/1994	16/ 9/1994	17/ 9/1994

2449613.5	2449614.5	2449615.5	2449616.5	2449617.5	2449618.5	2449619.5	2449620.5	2449621.5	2449622.5
49613.	49614.	49615.	49616.	49617.	49618.	49619.	49620.	49621.	49622.
16332	16333	16334	16335	16336	16337	16338	16339	16340	16341
261	262	263	264	265	266	267	268	269	270
18/ 9/1994	19/ 9/1994	20/ 9/1994	21/ 9/1994	22/ 9/1994	23/ 9/1994	24/ 9/1994	25/ 9/1994	26/ 9/1994	27/ 9/1994

2449623.5	2449624.5	2449625.5	2449626.5	2449627.5	2449628.5	2449629.5	2449630.5	2449631.5	2449632.5
49623.	49624.	49625.	49626.	49627.	49628.	49629.	49630.	49631.	49632.
16342	16343	16344	16345	16346	16347	16348	16349	16350	16351
271	272	273	274	275	276	277	278	279	280
28/ 9/1994	29/ 9/1994	30/ 9/1994	1/10/1994	2/10/1994	3/10/1994	4/10/1994	5/10/1994	6/10/1994	7/10/1994

2449633.5	2449634.5	2449635.5	2449636.5	2449637.5	2449638.5	2449639.5	2449640.5	2449641.5	2449642.5
49633.	49634.	49635.	49636.	49637.	49638.	49639.	49640.	49641.	49642.
16352	16353	16354	16355	16356	16357	16358	16359	16360	16361
281	282	283	284	285	286	287	288	289	290
8/10/1994	9/10/1994	10/10/1994	11/10/1994	12/10/1994	13/10/1994	14/10/1994	15/10/1994	16/10/1994	17/10/1994

2449643.5	2449644.5	2449645.5	2449646.5	2449647.5	2449648.5	2449649.5	2449650.5	2449651.5	2449652.5
49643.	49644.	49645.	49646.	49647.	49648.	49649.	49650.	49651.	49652.
16362	16363	16364	16365	16366	16367	16368	16369	16370	16371
291	292	293	294	295	296	297	298	299	300
18/10/1994	19/10/1994	20/10/1994	21/10/1994	22/10/1994	23/10/1994	24/10/1994	25/10/1994	26/10/1994	27/10/1994

2449653.5	2449654.5	2449655.5	2449656.5	2449657.5	2449658.5	2449659.5	2449660.5	2449661.5	2449662.5
49653.	49654.	49655.	49656.	49657.	49658.	49659.	49660.	49661.	49662.
16372	16373	16374	16375	16376	16377	16378	16379	16380	16381
301	302	303	304	305	306	307	308	309	310
28/10/1994	29/10/1994	30/10/1994	31/10/1994	1/11/1994	2/11/1994	3/11/1994	4/11/1994	5/11/1994	6/11/1994

2449663.5	2449664.5	2449665.5	2449666.5	2449667.5	2449668.5	2449669.5	2449670.5	2449671.5	2449672.5
49663.	49664.	49665.	49666.	49667.	49668.	49669.	49670.	49671.	49672.
16382	16383	16384	16385	16386	16387	16388	16389	16390	16391
311	312	313	314	315	316	317	318	319	320
7/11/1994	8/11/1994	9/11/1994	10/11/1994	11/11/1994	12/11/1994	13/11/1994	14/11/1994	15/11/1994	16/11/1994

2449673.5	2449674.5	2449675.5	2449676.5	2449677.5	2449678.5	2449679.5	2449680.5	2449681.5	2449682.5
49673.	49674.	49675.	49676.	49677.	49678.	49679.	49680.	49681.	49682.
16392	16393	16394	16395	16396	16397	16398	16399	16400	16401
321	322	323	324	325	326	327	328	329	330
17/11/1994	18/11/1994	19/11/1994	20/11/1994	21/11/1994	22/11/1994	23/11/1994	24/11/1994	25/11/1994	26/11/1994

2449683.5	2449684.5	2449685.5	2449686.5	2449687.5	2449688.5	2449689.5	2449690.5	2449691.5	2449692.5
49683.	49684.	49685.	49686.	49687.	49688.	49689.	49690.	49691.	49692.
16402	16403	16404	16405	16406	16407	16408	16409	16410	16411
331	332	333	334	335	336	337	338	339	340
27/11/1994	28/11/1994	29/11/1994	30/11/1994	1/12/1994	2/12/1994	3/12/1994	4/12/1994	5/12/1994	6/12/1994

2449693.5	2449694.5	2449695.5	2449696.5	2449697.5	2449698.5	2449699.5	2449700.5	2449701.5	2449702.5
49693.	49694.	49695.	49696.	49697.	49698.	49699.	49700.	49701.	49702.
16412	16413	16414	16415	16416	16417	16418	16419	16420	16421
341	342	343	344	345	346	347	348	349	350
7/12/1994	8/12/1994	9/12/1994	10/12/1994	11/12/1994	12/12/1994	13/12/1994	14/12/1994	15/12/1994	16/12/1994

2449703.5	2449704.5	2449705.5	2449706.5	2449707.5	2449708.5	2449709.5	2449710.5	2449711.5	2449712.5
49703.	49704.	49705.	49706.	49707.	49708.	49709.	49710.	49711.	49712.
16422	16423	16424	16425	16426	16427	16428	16429	16430	16431
351	352	353	354	355	356	357	358	359	360
17/12/1994	18/12/1994	19/12/1994	20/12/1994	21/12/1994	22/12/1994	23/12/1994	24/12/1994	25/12/1994	26/12/1994

2449713.5	2449714.5	2449715.5	2449716.5	2449717.5
49713.	49714.	49715.	49716.	49717.
16432	16433	16434	16435	16436
361	362	363	364	365
27/12/1994	28/12/1994	29/12/1994	30/12/1994	31/12/1994

Table B3 Calendar for the year 1995

CALENDAR

All dates are referred to 0h UT.
We find successively:
Julian day.
Modified Julian day.
1950 Julian day.
number of the day in the year.
gregorian date (day,month,year).

Recall:
Julian day number 0 begins at 12h UT on january 1st 4713 BC.
Modified Julian day number 0 begins at 0h UT on november 17th 1858 AD.
1950 Julian day number 1 begins at 0h UT on january 1st 1950 AD.

2449718.5	2449719.5	2449720.5	2449721.5	2449722.5	2449723.5	2449724.5	2449725.5	2449726.5	2449727.5
49718.	49719.	49720.	49721.	49722.	49723.	49724.	49725.	49726.	49727.
16437	16438	16439	16440	16441	16442	16443	16444	16445	16446
1	2	3	4	5	6	7	8	9	10
1/ 1/1995	2/ 1/1995	3/ 1/1995	4/ 1/1995	5/ 1/1995	6/ 1/1995	7/ 1/1995	8/ 1/1995	9/ 1/1995	10/ 1/1995

2449728.5	2449729.5	2449730.5	2449731.5	2449732.5	2449733.5	2449734.5	2449735.5	2449736.5	2449737.5
49728.	49729.	49730.	49731.	49732.	49733.	49734.	49735.	49736.	49737.
16447	16448	16449	16450	16451	16452	16453	16454	16455	16456
11	12	13	14	15	16	17	18	19	20
11/ 1/1995	12/ 1/1995	13/ 1/1995	14/ 1/1995	15/ 1/1995	16/ 1/1995	17/ 1/1995	18/ 1/1995	19/ 1/1995	20/ 1/1995

2449738.5	2449739.5	2449740.5	2449741.5	2449742.5	2449743.5	2449744.5	2449745.5	2449746.5	2449747.5
49738.	49739.	49740.	49741.	49742.	49743.	49744.	49745.	49746.	49747.
16457	16458	16459	16460	16461	16462	16463	16464	16465	16466
21	22	23	24	25	26	27	28	29	30
21/ 1/1995	22/ 1/1995	23/ 1/1995	24/ 1/1995	25/ 1/1995	26/ 1/1995	27/ 1/1995	28/ 1/1995	29/ 1/1995	30/ 1/1995

2449748.5	2449749.5	2449750.5	2449751.5	2449752.5	2449753.5	2449754.5	2449755.5	2449756.5	2449757.5
49748.	49749.	49750.	49751.	49752.	49753.	49754.	49755.	49756.	49757.
16467	16468	16469	16470	16471	16472	16473	16474	16475	16476
31	32	33	34	35	36	37	38	39	40
31/ 1/1995	1/ 2/1995	2/ 2/1995	3/ 2/1995	4/ 2/1995	5/ 2/1995	6/ 2/1995	7/ 2/1995	8/ 2/1995	9/ 2/1995

2449758.5	2449759.5	2449760.5	2449761.5	2449762.5	2449763.5	2449764.5	2449765.5	2449766.5	2449767.5
49758.	49759.	49760.	49761.	49762.	49763.	49764.	49765.	49766.	49767.
16477	16478	16479	16480	16481	16482	16483	16484	16485	16486
41	42	43	44	45	46	47	48	49	50
10/ 2/1995	11/ 2/1995	12/ 2/1995	13/ 2/1995	14/ 2/1995	15/ 2/1995	16/ 2/1995	17/ 2/1995	18/ 2/1995	19/ 2/1995

2449768.5	2449769.5	2449770.5	2449771.5	2449772.5	2449773.5	2449774.5	2449775.5	2449776.5	2449777.5
49768.	49769.	49770.	49771.	49772.	49773.	49774.	49775.	49776.	49777.
16487	16488	16489	16490	16491	16492	16493	16494	16495	16496
51	52	53	54	55	56	57	58	59	60
20/ 2/1995	21/ 2/1995	22/ 2/1995	23/ 2/1995	24/ 2/1995	25/ 2/1995	26/ 2/1995	27/ 2/1995	28/ 2/1995	1/ 3/1995

2449778.5	2449779.5	2449780.5	2449781.5	2449782.5	2449783.5	2449784.5	2449785.5	2449786.5	2449787.5
49778.	49779.	49780.	49781.	49782.	49783.	49784.	49785.	49786.	49787.
16497	16498	16499	16500	16501	16502	16503	16504	16505	16506
61	62	63	64	65	66	67	68	69	70
2/ 3/1995	3/ 3/1995	4/ 3/1995	5/ 3/1995	6/ 3/1995	7/ 3/1995	8/ 3/1995	9/ 3/1995	10/ 3/1995	11/ 3/1995

2449788.5	2449789.5	2449790.5	2449791.5	2449792.5	2449793.5	2449794.5	2449795.5	2449796.5	2449797.5
49788.	49789.	49790.	49791.	49792.	49793.	49794.	49795.	49796.	49797.
16507	16508	16509	16510	16511	16512	16513	16514	16515	16516
71	72	73	74	75	76	77	78	79	80
12/ 3/1995	13/ 3/1995	14/ 3/1995	15/ 3/1995	16/ 3/1995	17/ 3/1995	18/ 3/1995	19/ 3/1995	20/ 3/1995	21/ 3/1995

2449798.5	2449799.5	2449800.5	2449801.5	2449802.5	2449803.5	2449804.5	2449805.5	2449806.5	2449807.5
49798.	49799.	49800.	49801.	49802.	49803.	49804.	49805.	49806.	49807.
16517	16518	16519	16520	16521	16522	16523	16524	16525	16526
81	82	83	84	85	86	87	88	89	90
22/ 3/1995	23/ 3/1995	24/ 3/1995	25/ 3/1995	26/ 3/1995	27/ 3/1995	28/ 3/1995	29/ 3/1995	30/ 3/1995	31/ 3/1995

2449808.5	2449809.5	2449810.5	2449811.5	2449812.5	2449813.5	2449814.5	2449815.5	2449816.5	2449817.5
49808.	49809.	49810.	49811.	49812.	49813.	49814.	49815.	49816.	49817.
16527	16528	16529	16530	16531	16532	16533	16534	16535	16536
91	92	93	94	95	96	97	98	99	100
1/ 4/1995	2/ 4/1995	3/ 4/1995	4/ 4/1995	5/ 4/1995	6/ 4/1995	7/ 4/1995	8/ 4/1995	9/ 4/1995	10/ 4/1995

2449818.5	2449819.5	2449820.5	2449821.5	2449822.5	2449823.5	2449824.5	2449825.5	2449826.5	2449827.5
49818.	49819.	49820.	49821.	49822.	49823.	49824.	49825.	49826.	49827.
16537	16538	16539	16540	16541	16542	16543	16544	16545	16546
101	102	103	104	105	106	107	108	109	110
11/ 4/1995	12/ 4/1995	13/ 4/1995	14/ 4/1995	15/ 4/1995	16/ 4/1995	17/ 4/1995	18/ 4/1995	19/ 4/1995	20/ 4/1995

2449828.5	2449829.5	2449830.5	2449831.5	2449832.5	2449833.5	2449834.5	2449835.5	2449836.5	2449837.5
49828.	49829.	49830.	49831.	49832.	49833.	49834.	49835.	49836.	49837.
16547	16548	16549	16550	16551	16552	16553	16554	16555	16556
111	112	113	114	115	116	117	118	119	120
21/ 4/1995	22/ 4/1995	23/ 4/1995	24/ 4/1995	25/ 4/1995	26/ 4/1995	27/ 4/1995	28/ 4/1995	29/ 4/1995	30/ 4/1995

2449838.5	2449839.5	2449840.5	2449841.5	2449842.5	2449843.5	2449844.5	2449845.5	2449846.5	2449847.5
49838.	49839.	49840.	49841.	49842.	49843.	49844.	49845.	49846.	49847.
16557	16558	16559	16560	16561	16562	16563	16564	16565	16566
121	122	123	124	125	126	127	128	129	130
1/ 5/1995	2/ 5/1995	3/ 5/1995	4/ 5/1995	5/ 5/1995	6/ 5/1995	7/ 5/1995	8/ 5/1995	9/ 5/1995	10/ 5/1995

2449848.5	2449849.5	2449850.5	2449851.5	2449852.5	2449853.5	2449854.5	2449855.5	2449856.5	2449857.5
49848.	49849.	49850.	49851.	49852.	49853.	49854.	49855.	49856.	49857.
16567	16568	16569	16570	16571	16572	16573	16574	16575	16576
131	132	133	134	135	136	137	138	139	140
11/ 5/1995	12/ 5/1995	13/ 5/1995	14/ 5/1995	15/ 5/1995	16/ 5/1995	17/ 5/1995	18/ 5/1995	19/ 5/1995	20/ 5/1995

2449858.5	2449859.5	2449860.5	2449861.5	2449862.5	2449863.5	2449864.5	2449865.5	2449866.5	2449867.5
49858.	49859.	49860.	49861.	49862.	49863.	49864.	49865.	49866.	49867.
16577	16578	16579	16580	16581	16582	16583	16584	16585	16586
141	142	143	144	145	146	147	148	149	150
21/ 5/1995	22/ 5/1995	23/ 5/1995	24/ 5/1995	25/ 5/1995	26/ 5/1995	27/ 5/1995	28/ 5/1995	29/ 5/1995	30/ 5/1995

2449868.5	2449869.5	2449870.5	2449871.5	2449872.5	2449873.5	2449874.5	2449875.5	2449876.5	2449877.5
49868.	49869.	49870.	49871.	49872.	49873.	49874.	49875.	49876.	49877.
16587	16588	16589	16590	16591	16592	16593	16594	16595	16596
151	152	153	154	155	156	157	158	159	160
31/ 5/1995	1/ 6/1995	2/ 6/1995	3/ 6/1995	4/ 6/1995	5/ 6/1995	6/ 6/1995	7/ 6/1995	8/ 6/1995	9/ 6/1995

2449878.5	2449879.5	2449880.5	2449881.5	2449882.5	2449883.5	2449884.5	2449885.5	2449886.5	2449887.5
49878.	49879.	49880.	49881.	49882.	49883.	49884.	49885.	49886.	49887.
16597	16598	16599	16600	16601	16602	16603	16604	16605	16606
161	162	163	164	165	166	167	168	169	170
10/ 6/1995	11/ 6/1995	12/ 6/1995	13/ 6/1995	14/ 6/1995	15/ 6/1995	16/ 6/1995	17/ 6/1995	18/ 6/1995	19/ 6/1995

2449888.5	2449889.5	2449890.5	2449891.5	2449892.5	2449893.5	2449894.5	2449895.5	2449896.5	2449897.5
49888.	49889.	49890.	49891.	49892.	49893.	49894.	49895.	49896.	49897.
16607	16608	16609	16610	16611	16612	16613	16614	16615	16616
171	172	173	174	175	176	177	178	179	180
20/ 6/1995	21/ 6/1995	22/ 6/1995	23/ 6/1995	24/ 6/1995	25/ 6/1995	26/ 6/1995	27/ 6/1995	28/ 6/1995	29/ 6/1995

2449898.5	2449899.5	2449900.5	2449901.5	2449902.5	2449903.5	2449904.5	2449905.5	2449906.5	2449907.5
49898.	49899.	49900.	49901.	49902.	49903.	49904.	49905.	49906.	49907.
16617	16618	16619	16620	16621	16622	16623	16624	16625	16626
181	182	183	184	185	186	187	188	189	190
30/ 6/1995	1/ 7/1995	2/ 7/1995	3/ 7/1995	4/ 7/1995	5/ 7/1995	6/ 7/1995	7/ 7/1995	8/ 7/1995	9/ 7/1995

2449908.5	2449909.5	2449910.5	2449911.5	2449912.5	2449913.5	2449914.5	2449915.5	2449916.5	2449917.5
49908.	49909.	49910.	49911.	49912.	49913.	49914.	49915.	49916.	49917.
16627	16628	16629	16630	16631	16632	16633	16634	16635	16636
191	192	193	194	195	196	197	198	199	200
10/ 7/1995	11/ 7/1995	12/ 7/1995	13/ 7/1995	14/ 7/1995	15/ 7/1995	16/ 7/1995	17/ 7/1995	18/ 7/1995	19/ 7/1995

2449918.5	2449919.5	2449920.5	2449921.5	2449922.5	2449923.5	2449924.5	2449925.5	2449926.5	2449927.5
49918.	49919.	49920.	49921.	49922.	49923.	49924.	49925.	49926.	49927.
16637	16638	16639	16640	16641	16642	16643	16644	16645	16646
201	202	203	204	205	206	207	208	209	210
20/ 7/1995	21/ 7/1995	22/ 7/1995	23/ 7/1995	24/ 7/1995	25/ 7/1995	26/ 7/1995	27/ 7/1995	28/ 7/1995	29/ 7/1995

2449928.5	2449929.5	2449930.5	2449931.5	2449932.5	2449933.5	2449934.5	2449935.5	2449936.5	2449937.5
49928.	49929.	49930.	49931.	49932.	49933.	49934.	49935.	49936.	49937.
16647	16648	16649	16650	16651	16652	16653	16654	16655	16656
211	212	213	214	215	216	217	218	219	220
30/ 7/1995	31/ 7/1995	1/ 8/1995	2/ 8/1995	3/ 8/1995	4/ 8/1995	5/ 8/1995	6/ 8/1995	7/ 8/1995	8/ 8/1995

2449938.5	2449939.5	2449940.5	2449941.5	2449942.5	2449943.5	2449944.5	2449945.5	2449946.5	2449947.5
49938.	49939.	49940.	49941.	49942.	49943.	49944.	49945.	49946.	49947.
16657	16658	16659	16660	16661	16662	16663	16664	16665	16666
221	222	223	224	225	226	227	228	229	230
9/ 8/1995	10/ 8/1995	11/ 8/1995	12/ 8/1995	13/ 8/1995	14/ 8/1995	15/ 8/1995	16/ 8/1995	17/ 8/1995	18/ 8/1995

2449948.5	2449949.5	2449950.5	2449951.5	2449952.5	2449953.5	2449954.5	2449955.5	2449956.5	2449957.5
49948.	49949.	49950.	49951.	49952.	49953.	49954.	49955.	49956.	49957.
16667	16668	16669	16670	16671	16672	16673	16674	16675	16676
231	232	233	234	235	236	237	238	239	240
19/ 8/1995	20/ 8/1995	21/ 8/1995	22/ 8/1995	23/ 8/1995	24/ 8/1995	25/ 8/1995	26/ 8/1995	27/ 8/1995	28/ 8/1995

2449958.5	2449959.5	2449960.5	2449961.5	2449962.5	2449963.5	2449964.5	2449965.5	2449966.5	2449967.5
49958.	49959.	49960.	49961.	49962.	49963.	49964.	49965.	49966.	49967.
16677	16678	16679	16680	16681	16682	16683	16684	16685	16686
241	242	243	244	245	246	247	248	249	250
29/ 8/1995	30/ 8/1995	31/ 8/1995	1/ 9/1995	2/ 9/1995	3/ 9/1995	4/ 9/1995	5/ 9/1995	6/ 9/1995	7/ 9/1995

2449968.5	2449969.5	2449970.5	2449971.5	2449972.5	2449973.5	2449974.5	2449975.5	2449976.5	2449977.5
49968.	49969.	49970.	49971.	49972.	49973.	49974.	49975.	49976.	49977.
16687	16688	16689	16690	16691	16692	16693	16694	16695	16696
251	252	253	254	255	256	257	258	259	260
8/ 9/1995	9/ 9/1995	10/ 9/1995	11/ 9/1995	12/ 9/1995	13/ 9/1995	14/ 9/1995	15/ 9/1995	16/ 9/1995	17/ 9/1995

2449978.5	2449979.5	2449980.5	2449981.5	2449982.5	2449983.5	2449984.5	2449985.5	2449986.5	2449987.5
49978.	49979.	49980.	49981.	49982.	49983.	49984.	49985.	49986.	49987.
16697	16698	16699	16700	16701	16702	16703	16704	16705	16706
261	262	263	264	265	266	267	268	269	270
18/ 9/1995	19/ 9/1995	20/ 9/1995	21/ 9/1995	22/ 9/1995	23/ 9/1995	24/ 9/1995	25/ 9/1995	26/ 9/1995	27/ 9/1995

2449988.5	2449989.5	2449990.5	2449991.5	2449992.5	2449993.5	2449994.5	2449995.5	2449996.5	2449997.5
49988.	49989.	49990.	49991.	49992.	49993.	49994.	49995.	49996.	49997.
16707	16708	16709	16710	16711	16712	16713	16714	16715	16716
271	272	273	274	275	276	277	278	279	280
28/ 9/1995	29/ 9/1995	30/ 9/1995	1/10/1995	2/10/1995	3/10/1995	4/10/1995	5/10/1995	6/10/1995	7/10/1995

2449998.5	2449999.5	2450000.5	2450001.5	2450002.5	2450003.5	2450004.5	2450005.5	2450006.5	2450007.5
49998.	49999.	50000.	50001.	50002.	50003.	50004.	50005.	50006.	50007.
16717	16718	16719	16720	16721	16722	16723	16724	16725	16726
281	282	283	284	285	286	287	288	289	290
8/10/1995	9/10/1995	10/10/1995	11/10/1995	12/10/1995	13/10/1995	14/10/1995	15/10/1995	16/10/1995	17/10/1995

2450008.5	2450009.5	2450010.5	2450011.5	2450012.5	2450013.5	2450014.5	2450015.5	2450016.5	2450017.5
50008.	50009.	50010.	50011.	50012.	50013.	50014.	50015.	50016.	50017.
16727	16728	16729	16730	16731	16732	16733	16734	16735	16736
291	292	293	294	295	296	297	298	299	300
18/10/1995	19/10/1995	20/10/1995	21/10/1995	22/10/1995	23/10/1995	24/10/1995	25/10/1995	26/10/1995	27/10/1995

2450018.5	2450019.5	2450020.5	2450021.5	2450022.5	2450023.5	2450024.5	2450025.5	2450026.5	2450027.5
50018.	50019.	50020.	50021.	50022.	50023.	50024.	50025.	50026.	50027.
16737	16738	16739	16740	16741	16742	16743	16744	16745	16746
301	302	303	304	305	306	307	308	309	310
28/10/1995	29/10/1995	30/10/1995	31/10/1995	1/11/1995	2/11/1995	3/11/1995	4/11/1995	5/11/1995	6/11/1995

2450028.5	2450029.5	2450030.5	2450031.5	2450032.5	2450033.5	2450034.5	2450035.5	2450036.5	2450037.5
50028.	50029.	50030.	50031.	50032.	50033.	50034.	50035.	50036.	50037.
16747	16748	16749	16750	16751	16752	16753	16754	16755	16756
311	312	313	314	315	316	317	318	319	320
7/11/1995	8/11/1995	9/11/1995	10/11/1995	11/11/1995	12/11/1995	13/11/1995	14/11/1995	15/11/1995	16/11/1995

2450038.5	2450039.5	2450040.5	2450041.5	2450042.5	2450043.5	2450044.5	2450045.5	2450046.5	2450047.5
50038.	50039.	50040.	50041.	50042.	50043.	50044.	50045.	50046.	50047.
16757	16758	16759	16760	16761	16762	16763	16764	16765	16766
321	322	323	324	325	326	327	328	329	330
17/11/1995	18/11/1995	19/11/1995	20/11/1995	21/11/1995	22/11/1995	23/11/1995	24/11/1995	25/11/1995	26/11/1995

2450048.5	2450049.5	2450050.5	2450051.5	2450052.5	2450053.5	2450054.5	2450055.5	2450056.5	2450057.5
50048.	50049.	50050.	50051.	50052.	50053.	50054.	50055.	50056.	50057.
16767	16768	16769	16770	16771	16772	16773	16774	16775	16776
331	332	333	334	335	336	337	338	339	340
27/11/1995	28/11/1995	29/11/1995	30/11/1995	1/12/1995	2/12/1995	3/12/1995	4/12/1995	5/12/1995	6/12/1995

2450058.5	2450059.5	2450060.5	2450061.5	2450062.5	2450063.5	2450064.5	2450065.5	2450066.5	2450067.5
50058.	50059.	50060.	50061.	50062.	50063.	50064.	50065.	50066.	50067.
16777	16778	16779	16780	16781	16782	16783	16784	16785	16786
341	342	343	344	345	346	347	348	349	350
7/12/1995	8/12/1995	9/12/1995	10/12/1995	11/12/1995	12/12/1995	13/12/1995	14/12/1995	15/12/1995	16/12/1995

2450068.5	2450069.5	2450070.5	2450071.5	2450072.5	2450073.5	2450074.5	2450075.5	2450076.5	2450077.5
50068.	50069.	50070.	50071.	50072.	50073.	50074.	50075.	50076.	50077.
16787	16788	16789	16790	16791	16792	16793	16794	16795	16796
351	352	353	354	355	356	357	358	359	360
17/12/1995	18/12/1995	19/12/1995	20/12/1995	21/12/1995	22/12/1995	23/12/1995	24/12/1995	25/12/1995	26/12/1995

2450078.5	2450079.5	2450080.5	2450081.5	2450082.5
50078.	50079.	50080.	50081.	50082.
16797	16798	16799	16800	16801
361	362	363	364	365
27/12/1995	28/12/1995	29/12/1995	30/12/1995	31/12/1995

Appendix C Lanczos filtering

Let us consider a time series of real numbers with a given sampling period (not specified at present). Low pass Lanczos filter coefficients are given by:

$$c_n(i) = 2f_c \cdot \frac{\sin 2\pi f_c \cdot i}{2\pi f_c \cdot i} \cdot \frac{\sin \frac{\pi \cdot i}{n}}{\frac{\pi \cdot i}{n}} \quad \text{for } -n \le i \le n \qquad c_n(0) = 2f_c \tag{1}$$

where $f_c = \frac{1}{p_c}$ is the cut off frequency (inverse of the cut off period p_c) and n is the number of points of the half width of the filter (which thus has $2n$+1 points in all).

For example, with a time series $X(k)$, $k \in Z$, the filtered series $Y(k)$ will be given by

$$Y(k) = \sum_{j=-n}^{n} X(k+j) \cdot c_n(j) \tag{2}$$

The $\frac{\sin \frac{\pi \cdot j}{n}}{\frac{\pi \cdot j}{n}}$ in the expression of $c_n(j)$ are essentially the σ factors introduced by Lanczos (1961) to accelerate the convergence of Fourier series (thus the name Lanczos filter).

Figure C1 gives the transfer function amplitudes of Lanczos filters with p_c=3 and varying n. Period is given on horizontal axis in integral number of sampling intervals. Since the filter is symetrical, there is no phase shift except at very short periods (output may be in opposite phase with input) but with corresponding amplitudes negligible.

For the float data, sampled at 1 day interval, we have used p_c=3 and n=10 which corresponds in physical units to a cut off period of 3 days and 10 days half width.

Figure C2 shows the corresponding amplitude of the transfer functions.

When applying any filter to a time series, one has to consider how to filter the end values, since our symetrical filter spans $2n$+1 data points and can be applied without further assumption only for $n+1 \le k \le N-n$, N being the total number of data values.

Following a suggestion due to P.Y. Le Traon, we have used the same formulation as (2) but with n the number of points spanning the filter half-width replaced by the maximum possible number m of data values, available on both sides of the desired filtered value.

Thus,

if k = 1 or N, $Y(k) = X(k)$

if k = 2 or N-1, $Y(k) = \sum_{j=-1}^{1} X(k+j) \cdot c_1(j)$

and generally, $Y(k) = \sum_{j=-m}^{m} X(k+j) \cdot c_m(j) \qquad m \leq n$

We are aware that this procedure is not totally satisfying since as one goes near the end values, they are less and less filtered (Fig. C1). However, for those who would dislike the filtering done, the raw data files (not filtered) can be made available.

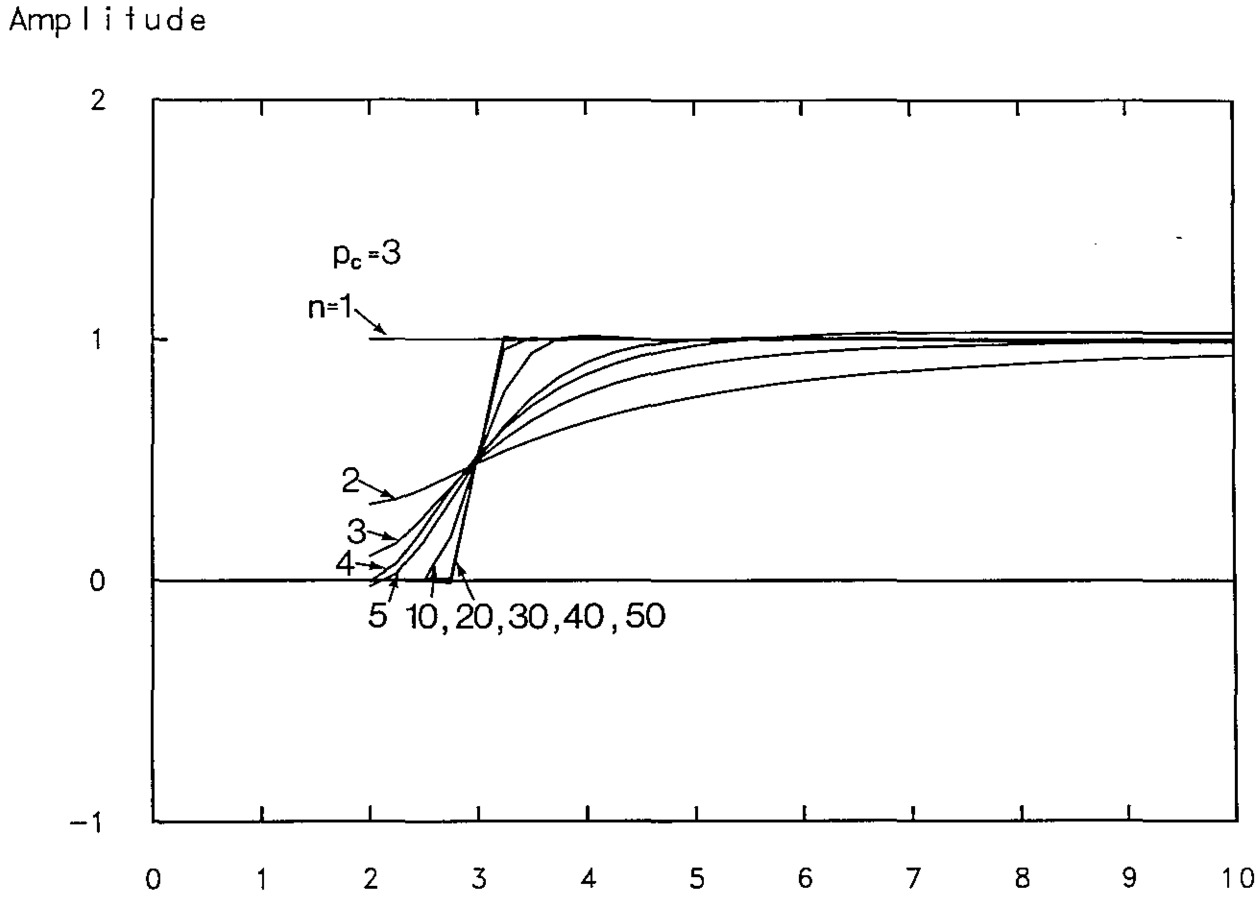


Figure C1 Lanczos filter transfer function amplitudes for a cut-off period of 3 temporal units and various half width (number of points used by the filter are 2n+1).

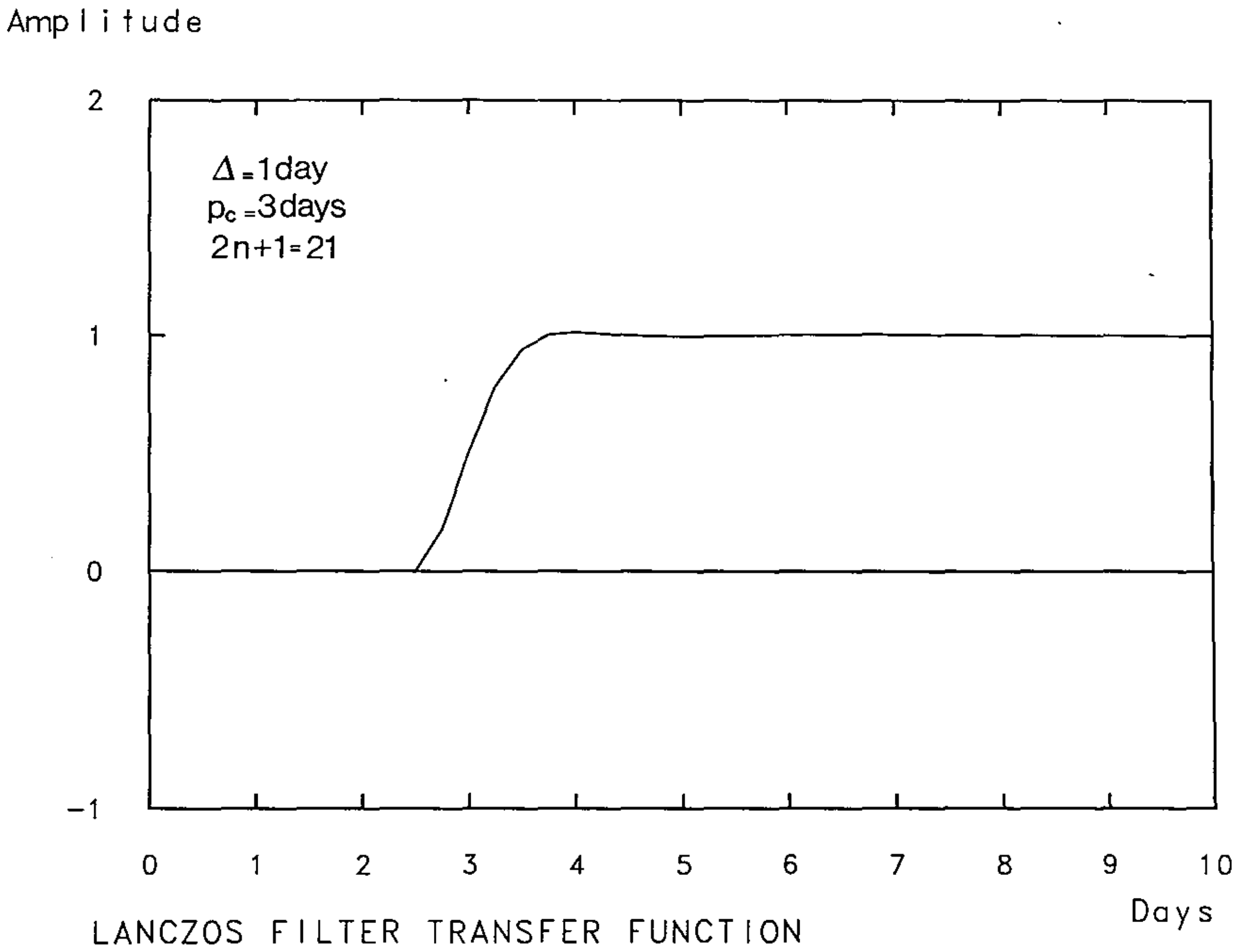


Figure C2 Transfer function amplitudes of the Lanczos filter used with the SAMBA1 float data (cut-off period of 3 days, 21 points).

Appendix D Sound sources for the SAMBA experiment

Sound sources used for the SAMBA experiment, are manufactured by Webb Research Corporation (WRC) and send on a regular basis (every 24 h or every 48 h for the array set in the Brazil basin and equatorial Atlantic) a linear FM chirp of 80 s duration and 1.523 Hz frequency excursion (from 259.375 Hz to 260.898 Hz), with a sound power level of ≈180 dbel relative to 1µPa at 1m.

The sound sources are fitted with a good quartz cristal clock, temperature compensated, with a generally assumed stability better than 10^{-8} in the short term (i.e. after one day), and probably better than 10^{-7} in the long term (i.e. after one year). Long term stability is mainly related to cristal aging. If one assumes a linear aging of the basic cristal frequency as is common practice with piezoelectric device, a $\frac{\Delta f}{f} = 10^{-7}$ after 1 year would imply a time error of 1.6 s at the end of the first year but 6.2 s at the end of the second year and 14 s after 3 years.

Standard WRC sound sources can emit an order of 4000 signals, or over a 10-year period with daily emissions. If one leaves sound sources unattended for such a long time, they probably will develop a notable drift.

A way of estimating sound source clock drifts has been discussed in Sections 4.5 and 4.6.

19 nominal positions have been instrumented thus far (see Fig. 4). For the float data given in this report, however, the B3 sound source was not used since it never worked at sea due to a bad plug. It was recovered in Spring 1995, repaired and remoored in September 1995.

Table D1 gives the characteristics for all the sound sources moored in South and Equatorial Atlantic. WHOI sources (#46, 51, 52, 53, 54, 69, 75, 76, 77) were recovered in Spring 1995, refurbished with new batteries, their pong repeat rate changed to one per day, and most of them remoored at the same nominal positions (#46N, 51N, 52N, 53N, 54N, 69N, 75N, 76N and 77N). IFM Kiel sound sources are labeled K0, K1, K2, K3, K4, KB and K6. KB replaced K0 at almost the same nominal position, after K0 went adrift. IFREMER/LPO Brest sound sources are labeled B1, B2, B3 and B4. IFM Kiel, IFREMER/LPO Brest and WHOI sound sources (second setting) emit daily. WHOI sound sources of the first setting were emitting only on odd Modified Julian day (i.e. on January 1st 1993, January 3rd 1993, ..., January 2nd 1994, January 4th 1994, ...). A typical mooring for sound source, actually the one used for B1, B2, B3 and B4, is shown in Figure D1.

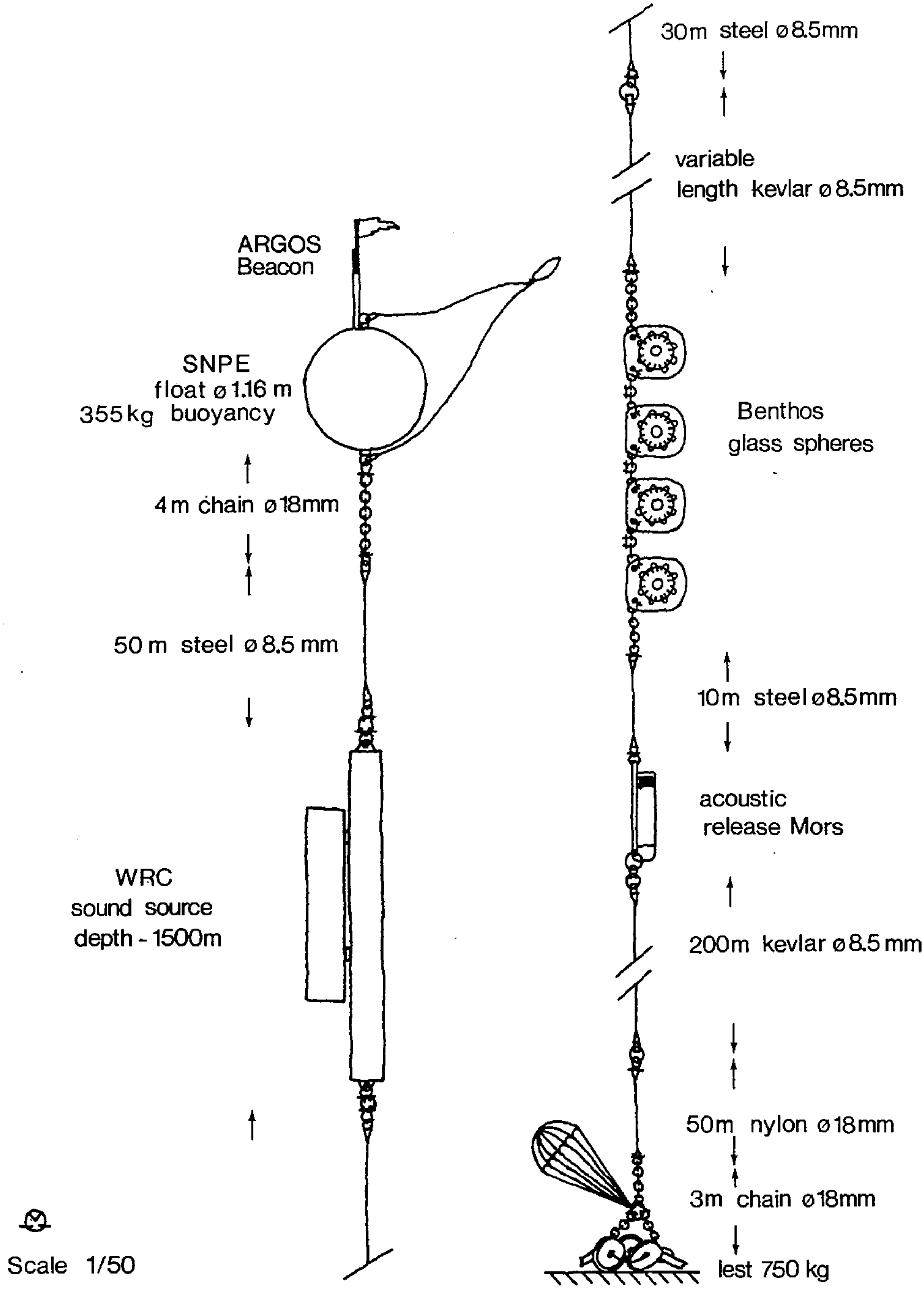


Figure D1 Typical mooring design used for sound source deployment (actually for B1, B2, B3 and B4).

Table D1 Sound source characteristics and life history

sound source id.	depth	moored position	mooring date	recovery date	clock advance at mooring rel. to UTC at launch	clock advance at recovery rel. to UTC at launch	pong time (rel. to UTC at launch) rel. to TAI
46	2000 m	27°05.94'S 20°12.02'W	25/10/1992	14/03/1995	25/10/1992 +0.000s	14/03/1995 -5.0s	(0h30) 0h30mn27s on odd MJD
51	2000 m	22°06.90'S 33°37.44'W	01/11/1992	09/03/1995	01/11/1992 +0.031s	09/03/1995 -3.0s	(0h30) 0h30mn27s on odd MJD
52	2000 m	11°18.10'S 19°59.67'W	19/10/1992	19/02/1995	19/10/1992 +0.026s	19/02/1995 -4.8s	(0h30) 0h30mn27s on odd MJD
53	2000 m	19°43.88'S 22°43.22'W	23/10/1992	16/03/1995	23/10/1992 +0.000s	16/03/1995 -3.8s	(1h30) 1h30mn27s on odd MJD
54	2000 m	00°22.78'S 32°37.28'W	02/10/1992	13/02/1995	02/10/1992 +0.125s	13/02/1995 -4.8s	(1h00) 1h00mn27s on odd MJD
69	2000 m	27°06.62'S 30°36.36'W	28/10/1992	10/03/1995	28/10/1992 -0.010s	10/03/1995 -2.7s	(1h00) 1h00mn27s on odd MJD
75	2000 m	03°41.84'S 31°12.54'W	08/10/1992	13/02/1995	08/10/1992 +0.032s	13/02/1995 -4.7s	(0h30) 0h30mn27s on odd MJD
76	2000 m	14°05.54'S 30°02.93'W	05/11/1992	23/02/1995	05/11/1992 (-0.001s)	23/02/1995 -5.6s	(1h00) 1h00mn27s on odd MJD

Table D1 Sound source characteristics and life history

sound source id.	depth	moored position	mooring date	recovery date	clock advance at mooring rel. to UTC at launch	clock advance at recovery rel. to UTC at launch	pong time (rel. to UTC at launch) rel. to TAI
77	2000 m	02°50.88'S 21°24.10'W	05/10/1992	08/04/1995	05/10/1992 +0.003s	08/04/1995 -10.8s	(1h30) 1h30mn27s on odd MJD
46N instrument from 51	2000 m	27°05.82'S 20°12.82'W	14/03/1995		14/03/1995 0.0s		(0h30) 0h30mn29s daily
51N instrument from 52	2000 m	22°06.48'S 33°38.04'W	09/03/1995		09/03/1995 +0.4s		(0h30) 0h30mn29s daily
52N instrument from 54	2000 m	11°17.82'S 20°00.72'W	19/02/1995		19/02/1995 +0.2s		(0h30) 0h30mn29s daily
53N instrument from 46	2000 m	19°44.22'S 22°42.78'W	16/03/1995		16/03/1995 0.0s		(1h30) 1h30mn29s daily
54N	2000 m	00°19.62'S 32°38.58'W	12/02/1995		12/02/1995 +0.4s		(1h00) 1h00mn29s daily
69N instrument from 76	2000 m	27°07.86'S 30°36.30'W	10/03/1995		10/03/1995 0.0s		(1h00) 1h00mn29s daily
75N	2000 m	03°42.42'S 31°12.54'W	13/02/1995		13/02/1995 +0.4s		(0h30) 0h30mn29s daily

Table D1   Sound source characteristics and life history

sound source id.	depth	moored position	mooring date	recovery date	clock advance at mooring rel. to UTC at launch	clock advance at recovery rel. to UTC at launch	pong time (rel. to UTC at launch) rel. to TAI
76N instrument from 75	2000 m	14°05.64'S 30°03.66'W	23/02/1995		23/02/1995 +0.1s		(1h00) 1h00mn29s daily
77N instrument from 53	2000 m	02°50.88'S 21°24.00'W	08/04/1995		08/04/1995 +0.3s		(1h30) 1h30mn29s daily
K0	1000 m	34°18.9S 28°30.0'W	11/12/1992		11/12/1992 0.0s	surfaced on February 14th 1994 near 18h20 UT (first ARGOS message)	(1h30) 1h30mn27s daily
K1	1000 m	28°49.7'S 44°26.3'W	25/11/1992		25/11/1992 0.0s		(1h30) 1h30mn27s daily
K2	1000 m	31°07.5'S 39°54.1'W	06/12/1992		06/12/1992 0.0s		(0h30) 0h30mn27s daily
K3	1000 m	26°52.0'S 34°47.2'W	18/12/1992		18/12/1992 0.0s		(1h00) 1h00mn27s daily
K4	1000 m	39°51.6'S 34°32.9'W	07/06/1994 at 15h UT		07/06/1994 0.0s		(1h00) 1h00mn28s daily
KB	1000 m	34°13.4'S 28°38.4'W	02/06/1994 at 15h UT		02/06/1994 -1.0s		(1h35) 1h35mn28s daily

Table D1 Sound source characteristics and life history

sound source id.	depth	moored position	mooring date	recovery date	clock advance at mooring rel. to UTC at launch	clock advance at recovery rel. to UTC at launch	pong time (rel. to UTC at launch) rel. to TAI
K6	1100 m	40°03.5'S 50°08.5'N	15/11/1994 at 18h UT		15/11/1994 ≈ -1.5s		(0h30) 0h30mn29s daily
B1	1500 m	7°01.7'N 49°55.5'W	01/01/1995 at 22h30 UT		01/01/1995 ±0.3s		(1h00) 1h00mn29s daily
B2	1500 m	9°59.5'N 40°00.5'W	04/01/1995 at 12h40 UT		04/01/1995 ±0.3s		(1h30) 1h30mn29s daily
B3 second setting	1500 m	4°51.2'N 15°08.6'W	10/09/1995		10/09/1995 0.0s		(1h00) 1h00mn29s daily
B4	1500 m	3°59.9'S 10°00.1'W	05/11/1994		03/11/1994 +0.293s		(0h30) 0h30mn29s daily

Appendix E Sound speed atlas used for the float tracking

To obtain a good accuracy of the float positions, mean sound speeds between an imaginary float (situated at grid points of a 2° in latitude by 5° in longitude grid, and at 800 m depth) and the 19 sound source nominal positions and depths, have been estimated using geometrical acoustics (ray tracing) and the 3D field of sound velocity from the 1° square Levitus (1982) Atlas.

Figure E1 shows the grid points where mean sound speeds have been obtained and Table E1 gives the values estimated.

As an illustration, sound eigenrays are plotted in Figure E2 for a float drifting near 27°S, 43°W at 800 m depth and the K3 sound source. The quasi-sinusoidal signal sketched at the top of the figure is the theoretical signal received by the float, were there no noise or sound absorption along the propagation path. Assumption is that a $4\pi \approx 12.6$ W power is radiated omnidirectionnaly by the sound source transducer (or sound intensity is of 1 W m^{-2} at 1 m). The various ray characteristics are also given in the figure. The time of propagation considered for obtaining the mean speed of sound is the one corresponding to the maximum intensity). Intensity is given in dbel by $120 + 10 \log_{10}(I(W\ m^{-2}))$.

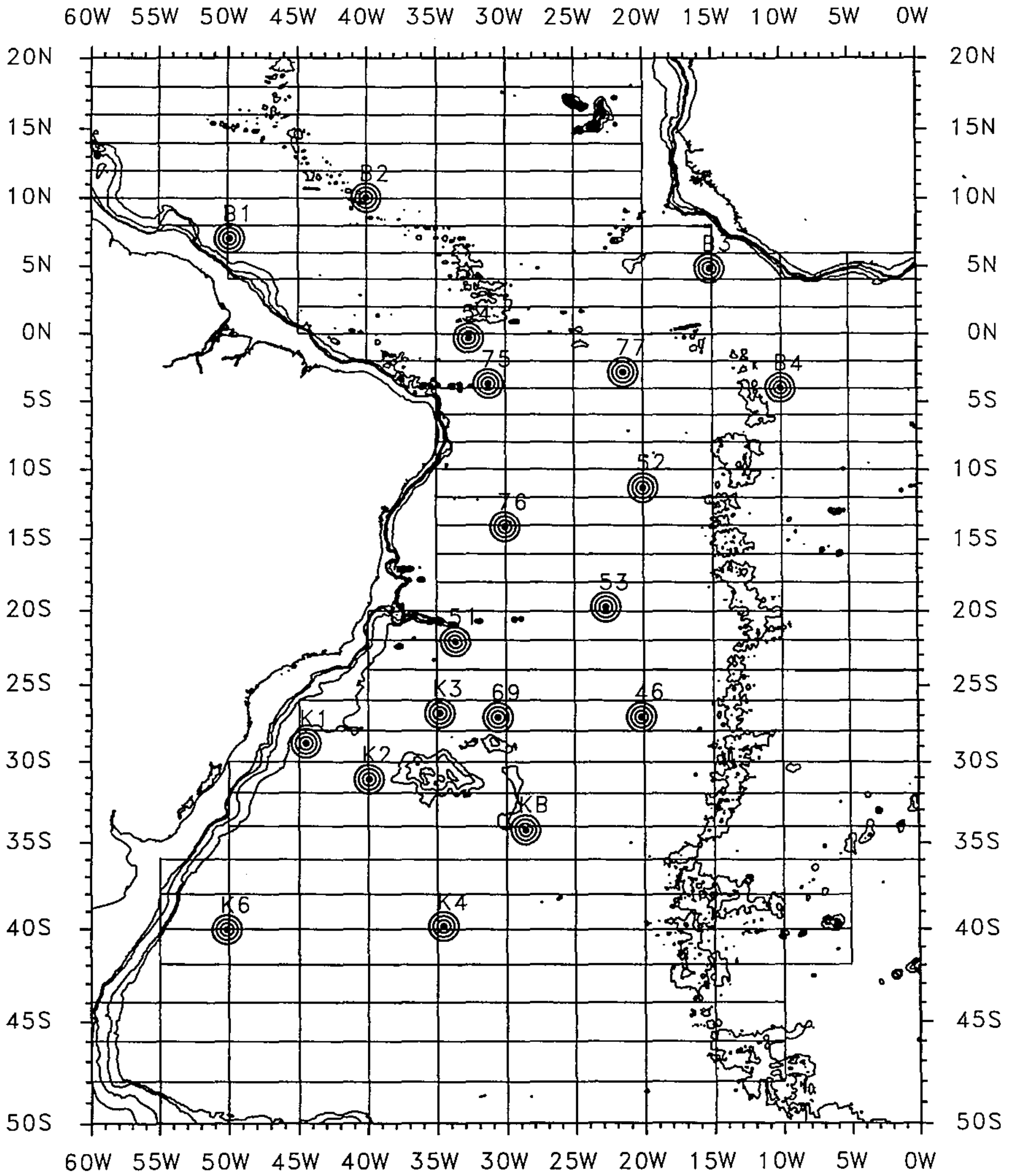


Figure E1 Grid points at which mean sound speeds from the given sources are estimated.

lat1:-26.9 ; long1: -34.8
lat2:-27.0 ; long2: -43.0

source depth: 1000.00 m, receiver depth: 800.00 m, distance: 815.504 km
maximal vertical distance to the receiver: 3.000 m
angle min: -10.0000, angle max: 10.0000

angle(deg)	temps(s)	arc length(m)	intensity(db)
-9.8261	548.3367	819901.5398	10.63
-9.3019	548.6311	819602.5991	10.61
-8.7223	549.1356	819251.1893	11.70
-8.2220	549.6010	818891.6121	8.43
-7.6822	549.7500	818682.7232	12.44
-6.9786	550.0616	818221.1743	15.10
-6.8638	550.0829	818133.7341	14.13
-6.1459	550.2981	817679.4564	12.92
-6.0347	550.3118	817618.4113	14.07
-5.6903	550.3923	817415.9349	16.77
-5.5748	550.4028	817344.5529	16.15
-5.0344	550.4698	817021.3617	16.66
-4.9314	550.4762	816961.9099	14.15
-4.7337	550.5310	816834.9560	13.71
-4.0284	550.5814	816544.9113	23.53
-3.8882	550.5814	816474.5778	22.36
-3.5775	550.5804	816315.2803	21.97
-3.4740	550.5812	816277.3647	23.22
4.4199	550.5584	816702.0949	19.53
4.7651	550.5024	816913.9823	14.38
5.3857	550.4356	817240.3436	15.45
5.8981	550.3499	817538.7522	14.39
6.3219	550.2487	817795.6575	12.95
6.7538	550.1314	818056.9590	12.01
7.2743	549.9949	818396.9169	15.10
7.6106	549.8395	818573.6596	13.25
8.0002	549.6686	818819.7303	7.88
8.2819	549.4710	819116.7681	12.49
8.3990	549.4330	819191.4100	9.38
8.5854	549.2537	819224.0795	7.32
8.8305	549.0219	819322.8210	9.04
9.2087	548.7694	819509.8527	8.67
9.3285	548.7207	819558.2169	7.82
9.5615	548.4902	819769.4763	12.18

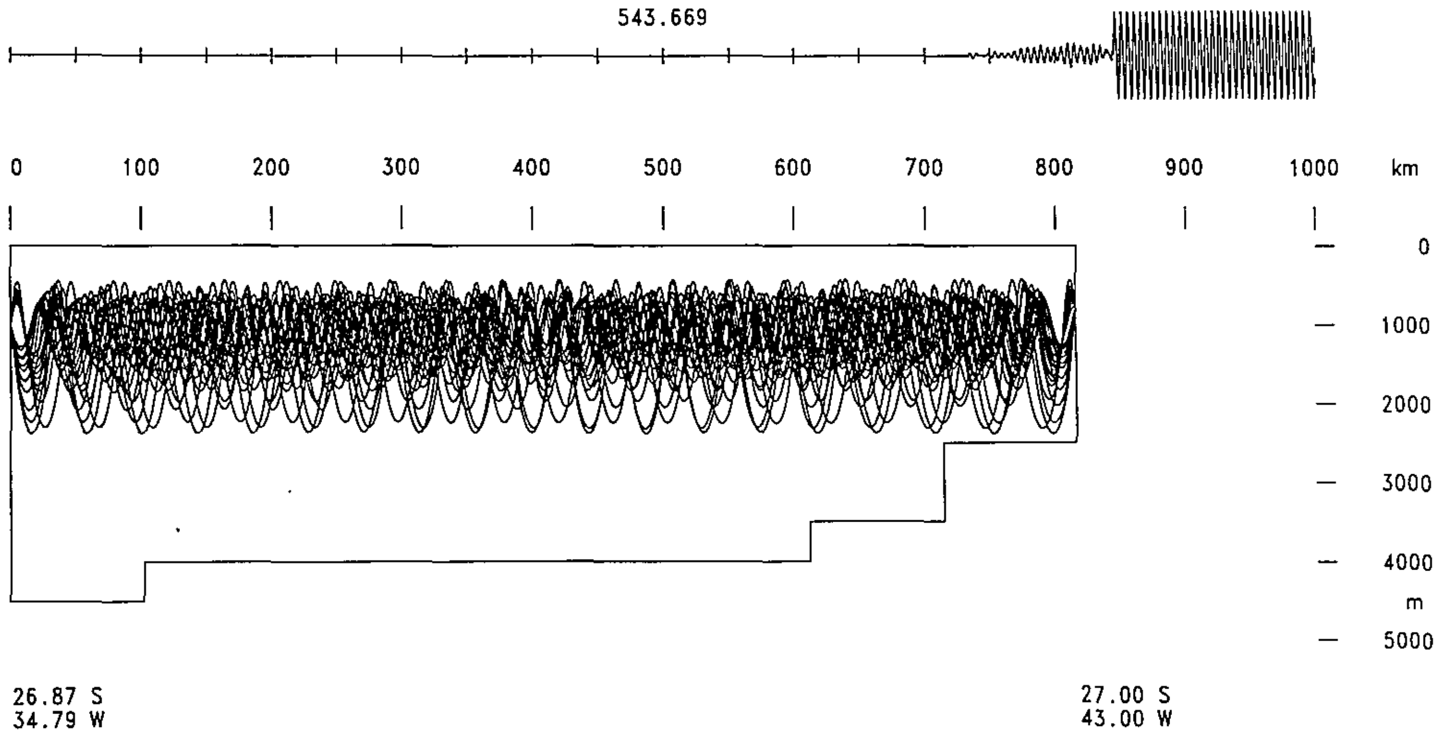


Figure E2 Eigenrays between K3 sound source and a float situated near 27°S 43°W at 800 m depth (bottom of the figure). Sketch of the signal amplitude received by the float (without scale). Had the mean speed of sound been 1500 m s^{-1}, the signal front would have been received after a 543.7 s propagation time.

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
20N-60W																1489.8			
20N-55W																1489.6	1490.6		
20N-50W																1490.0	1489.9		
20N-45W																1489.4	1490.9		
20N-40W																1489.4	1490.1		
20N-35W																1489.5	1490.6		
20N-30W																	1490.5		
20N-25W																	1490.8	1489.9	
20N-20W																		1490.1	
18N-60W																1490.1			
18N-55W																1490.0	1489.7		
18N-50W																1489.1	1489.6		
18N-45W																1488.7	1489.8		
18N-40W					1488.5											1489.0	1489.8		
18N-35W					1488.9											1489.5	1489.9		
18N-30W					1488.9												1490.1	1489.3	
18N-25W					1489.2												1490.4	1489.3	
18N-20W																		1489.2	
16N-60W																1488.4			
16N-55W																1489.7	1489.3		
16N-50W																1489.0	1490.2		
16N-45W																1488.4	1490.5		
16N-40W					1488.2											1488.8	1490.4		

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
16N-35W					1488.3											1488.9	1489.4		
16N-30W					1489.1		1488.7										1490.8	1490.5	
16N-25W					1488.9				1488.5								1490.3	1488.8	
16N-20W									1489.8									1488.7	
14N-60W																1487.5			
14N-55W																1488.1	1488.4		
14N-50W																1490.0	1488.9		
14N-45W					1488.5											1488.5	1489.0		
14N-40W					1487.9		1488.9									1488.4	1489.4		
14N-35W					1488.3		1487.8									1488.5	1489.2		
14N-30W					1488.3		1488.0		1488.1								1489.3	1489.1	
14N-25W					1488.5		1488.8		1488.2								1489.8	1488.3	
14N-20W					1488.9				1488.4									1488.4	
12N-60W																1486.8	1488.0		
12N-55W																1488.4	1488.4		
12N-50W																1487.3	1488.6		
12N-45W					1487.9											1487.9	1488.3		
12N-40W					1488.5		1487.7									1487.7	1488.9		
12N-35W					1488.4		1487.6									1488.6	1488.6		
12N-30W					1488.4		1488.3		1487.9								1489.2	1488.7	
12N-25W					1488.6		1487.9		1487.8								1489.2	1489.9	
12N-20W					1488.2		1489.3		1489.3								1489.5	1487.7	1486.5
10N-60W																1486.8	1487.4		

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
10N-55W																1487.3	1488.1		
10N-50W																1486.8	1488.4		
10N-45W					1489.0		1487.7									1487.4	1487.8		
10N-40W					1488.1		1487.1									1487.4			
10N-35W					1487.6		1487.9		1488.5							1487.9	1488.2		
10N-30W					1487.8		1487.7		1487.3								1488.3	1487.2	
10N-25W					1487.8		1488.7		1488.8								1488.4	1488.3	
10N-20W					1488.0		1488.2		1489.0								1489.1	1490.0	1486.2
8N-55W																1486.8	1487.7		
8N-50W					1487.3												1487.7		
8N-45W					1487.1		1487.6									1487.3	1487.4		
8N-40W					1487.3		1487.7									1487.3	1488.1		
8N-35W					1487.2		1488.0		1488.1							1487.2	1488.3		
8N-30W					1487.3		1488.4		1487.1								1488.0	1487.8	
8N-25W					1488.5		1488.7		1487.1								1488.6	1487.1	1489.1
8N-20W			1488.1		1487.4		1488.8		1487.1									1486.6	1485.4
8N-15W					1489.1				1487.1									1486.3	1489.3
6N-50W					1487.2											1486.9	1486.5		
6N-45W					1487.1		1488.2									1486.9	1486.8		
6N-40W					1488.3		1487.1									1486.6	1488.2		
6N-35W					1488.4		1487.1		1486.9							1487.1	1486.8		
6N-30W					1488.7		1487.4		1488.8								1488.1	1488.0	
6N-25W			1488.0		1487.3		1487.1		1486.9								1486.9	1486.3	1484.9

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
6N-20W			1486.4		1487.9		1487.1		1489.2									1486.3	1484.9
6N-15W			1489.2		1487.2		1487.1		1489.4									1485.8	1485.1
6N-10W									1488.4									1485.2	1484.7
6N-0W																			1484.2
4N-50W					1485.8											1488.1	1486.6		
4N-45W					1487.1		1486.9									1487.4	1487.1		
4N-40W					1487.1		1488.7									1486.1	1486.9		
4N-35W					1489.2		1487.0	1486.2	1486.8							1487.8	1487.7		
4N-30W			1486.4		1487.0		1488.0	1487.2	1487.1								1487.8	1485.6	
4N-25W			1486.3		1486.9		1488.3	1486.1	1487.0								1486.4	1485.7	1488.8
4N-20W			1487.9		1488.9		1488.5		1486.6									1489.2	1485.0
4N-15W			1487.7		1489.0		1488.0		1486.6									1486.3	1484.9
4N-10W			1486.3						1487.2									1485.3	1489.3
4N-5W									1486.5									1485.1	1484.4
4N-0W																		1484.8	1484.4
2N-45W					1487.0		1487.6									1486.1	1487.1		
2N-40W					1488.1		1488.0	1485.1	1486.9							1487.1	1488.1		
2N-35W					1487.8		1487.9	1486.1	1486.8							1486.9	1487.5		
2N-30W			1486.2		1486.9		1487.2	1486.0	1486.7								1487.4	1485.3	
2N-25W			1487.5		1486.8		1486.9	1487.1	1488.9								1488.5	1485.2	1485.5
2N-20W			1486.1		1486.8		1486.8	1488.2	1489.3									1489.8	1489.0
2N-15W			1486.2		1486.7		1488.5		1486.8									1485.3	1484.6
2N-10W			1486.1						1488.9									1485.0	1485.0

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
2N-5W									1488.9									1484.9	1484.3
2N-0W																		1485.1	1486.4
0N-45W					1487.0		1486.7									1486.4	1486.9		
0N-40W					1488.0		1486.8		1486.9							1488.0	1486.3		
0N-35W			1486.5		1488.6		1487.0	1487.9	1488.2							1487.6	1488.9		
0N-30W			1486.1		1488.6		1488.4	1487.0	1487.1								1488.7	1484.8	
0N-25W			1487.6	1488.1	1488.3		1486.9	1487.7	1486.6								1486.6	1489.2	1485.6
0N-20W			1486.1		1486.7		1486.8	1486.3	1489.7									1484.8	1484.7
0N-15W			1486.8		1489.0		1486.7		1486.6									1486.2	1488.8
0N-10W			1486.1						1489.1									1484.7	1484.1
0N-5W			1486.2						1487.1									1485.4	1484.2
0N-0W																		1486.6	1484.3
2S-40W					1487.0		1486.9		1487.0							1487.0	1488.9		
2S-35W			1487.0		1487.6		1487.7	1488.2	1486.9							1485.4	1488.3		
2S-30W			1486.7	1485.7	1488.4		1488.7	1485.6	1486.9								1488.0	1484.5	
2S-25W			1486.0	1485.3	1488.1		1486.9	1485.6	1489.2								1485.7	1484.5	1488.1
2S-20W			1486.0	1485.6	1486.8		1486.7	1488.7										1484.4	1484.3
2S-15W			1486.0	1486.8	1489.1		1486.6	1485.5	1486.8									1484.5	1484.3
2S-10W			1486.2						1486.5									1484.4	1484.2
2S-5W			1487.9						1486.6									1484.5	1484.0
2S-0W																		1484.4	1484.7
4S-35W			1485.6	1484.3	1486.6		1488.0	1487.5	1487.9							1486.6	1488.0		
4S-30W		1485.4	1486.2	1487.0	1486.9		1488.1	1485.3	1487.5								1488.8	1484.5	

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
4S-25W			1485.7	1484.1	1487.5		1486.7	1485.7	1487.4									1488.7	1488.0
4S-20W			1486.8	1486.4	1488.2		1487.5	1485.5	1486.8									1484.1	1484.4
4S-15W			1485.9	1485.1	1488.1		1487.1	1485.6	1486.7									1489.1	1484.1
4S-10W			1487.2						1488.3									1485.9	
4S-5W			1485.9						1486.6									1487.3	1484.1
4S-0W																		1489.3	1484.0
6S-35W		1484.2	1485.0	1486.4	1485.7		1484.6	1484.8	1486.0							1484.7	1487.1		
6S-30W		1485.2	1486.2	1484.9	1487.9			1485.2	1486.6								1484.6	1488.6	
6S-25W		1485.1	1486.1	1485.7	1487.6		1488.0	1485.0	1488.0									1488.6	1486.3
6S-20W			1485.9	1484.8	1487.9		1486.3	1485.2	1488.2									1484.2	1487.7
6S-15W			1485.6	1485.0	1487.7		1486.4	1487.7	1486.8									1483.9	1487.7
6S-10W			1485.5	1484.8					1486.6									1485.5	1484.0
6S-5W			1485.6						1486.6									1484.2	1484.6
6S-0W																		1489.1	1484.8
8S-35W		1484.6			1484.9	1486.9	1484.5		1485.8			1480.1							
8S-30W		1486.5	1485.2	1484.7	1486.3	1488.2	1486.7	1485.4	1486.1			1480.3						1488.6	
8S-25W	1483.9	1489.1	1485.5	1484.6	1487.1	1488.7	1486.0	1486.7	1486.1									1484.1	1487.1
8S-20W	1483.8	1485.0	1486.3	1484.6	1486.4		1487.0	1485.1	1486.5									1488.5	1484.0
8S-15W	1484.2		1485.3	1484.6	1486.4		1486.0	1485.1	1486.3									1483.6	1484.1
8S-10W			1485.3	1484.6					1486.6									1488.6	1484.0
8S-5W			1485.4						1486.7									1485.1	1487.5
8S-0W																			1484.2
10S-35W		1490.5	1486.3	1484.7	1486.4	1485.9	1487.5	1485.1	1486.8			1480.2							

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
10S-30W	1487.8	1485.1	1485.1	1486.5	1486.0	1484.0	1486.2	1484.9	1488.0			1480.2							
10S-25W	1485.0	1485.2	1485.4	1486.3	1486.9	1485.0	1485.8	1485.0	1485.9			1480.4						1488.4	1483.7
10S-20W	1486.8	1488.5		1484.5	1486.9	1484.0	1485.7	1486.8	1487.2									1483.6	1485.9
10S-15W	1483.9		1485.1	1484.4			1485.8	1484.8	1486.0									1483.6	1486.8
10S-10W	1484.5		1485.1	1484.4					1486.1									1488.3	1488.1
10S-5W			1485.3	1486.1					1486.2									1483.9	1488.3
10S-0W			1485.4																1487.9
12S-35W		1485.6	1486.2	1485.1	1486.1	1485.0	1486.2	1486.8	1485.9		1483.4	1480.0							
12S-30W	1484.2	1486.0	1485.0	1484.4	1486.0	1485.1	1486.8	1485.3	1485.6			1480.0							
12S-25W	1484.9	1485.8	1485.0	1483.9	1485.9	1484.7	1485.8	1486.4	1487.0			1480.2						1486.1	1483.8
12S-20W	1484.5	1485.1		1484.5	1486.8	1484.0	1485.6	1485.3	1487.3									1483.4	1485.3
12S-15W	1483.7		1485.1	1484.3			1485.6	1484.8	1486.7									1483.6	1483.7
12S-10W	1484.5		1485.9	1484.3				1484.8	1485.9									1487.9	1484.5
12S-5W			1485.2	1486.6					1485.9									1486.8	1487.7
12S-0W			1485.0																1484.0
14S-35W	1486.6	1485.6	1485.9	1486.9	1486.1	1486.4	1485.9	1487.0	1485.5	1480.8	1480.5	1480.1							
14S-30W	1484.4	1487.0	1488.2	1484.6	1485.8	1488.2	1485.9		1485.5		1480.4	1480.2							
14S-25W	1483.8	1484.7	1484.9	1484.4	1485.9	1487.0	1486.4	1486.4	1485.5			1480.2							1483.2
14S-20W	1483.7	1486.9	1485.5	1484.0	1485.8	1484.3	1485.6	1484.7	1485.7			1480.4						1483.2	1486.5
14S-15W	1484.0	1486.4	1485.8	1485.9		1483.6	1485.4	1484.6	1485.5									1487.6	1483.5
14S-10W	1483.5		1484.8	1484.5				1484.6	1485.7									1483.6	1484.1
14S-5W	1485.0		1484.8	1484.2					1485.9										1486.9
14S-0W			1484.9																1484.0

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
16S-35W	1484.3	1485.5	1485.0	1485.6	1485.9	1489.4	1486.7	1486.7	1488.1	1480.8	1480.6	1483.7		1481.3					
16S-30W	1484.7	1489.0	1484.8	1485.4	1485.8	1484.1	1485.4	1486.9	1485.5	1480.6	1480.5	1480.1		1480.9					
16S-25W	1484.2	1485.1	1484.7	1484.6	1486.6	1484.0	1486.3	1485.1	1486.2			1482.9		1483.7					1486.4
16S-20W	1484.2	1486.6	1485.3	1484.0		1484.4	1485.3	1489.6	1489.0			1480.4		1480.8					1483.1
16S-15W	1483.7	1486.6	1484.6	1484.3		1483.5		1484.6	1486.5										1486.1
16S-10W	1483.9		1484.6	1484.2				1486.1	1486.6										1483.5
16S-5W	1484.4		1484.6	1484.4															1483.5
16S-0W																			1487.0
18S-35W	1490.7	1485.2	1486.5	1485.1	1485.8	1492.2	1487.1	1485.3		1480.9	1480.7	1480.5		1480.7					
18S-30W	1484.0	1486.0	1485.1	1485.0	1486.1	1489.3	1487.7	1484.9	1485.4	1480.8	1480.6	1480.3		1480.8					
18S-25W	1489.0	1487.2	1484.7	1484.5	1486.7	1484.0	1485.4	1485.1	1486.5		1482.9	1480.4		1482.8					
18S-20W	1488.1	1484.5	1484.4	1484.2		1484.0	1486.5	1484.4	1485.0			1480.7		1480.7					1486.3
18S-15W	1487.6	1487.0	1484.5	1484.3		1484.4		1484.4	1486.2										1486.4
18S-10W	1484.2		1484.5	1483.9				1484.3	1486.8										1486.7
18S-5W	1487.6		1486.4	1484.1															1485.9
18S-0W																			1484.2
20S-40W	1484.3	1485.9		1486.1		1484.6					1481.1	1480.8		1481.0					
20S-35W	1484.4	1486.5	1485.2	1485.0	1485.9	1485.9	1489.6	1485.5		1481.0	1480.9	1480.5		1480.9					
20S30W	1484.8	1485.4	1484.9	1486.3	1486.5	1484.3	1485.6	1485.7	1485.3	1481.0	1480.8	1480.4		1481.5					
20S-25W	1483.7	1487.2	1484.6	1489.1		1487.1	1486.5	1484.9	1486.8	1481.3	1480.8	1484.2		1481.0					
20S-20W	1483.5	1486.2	1484.7	1484.1		1483.1	1486.7	1484.6	1485.0			1480.7		1480.8					1485.1
20S-15W	1483.7	1484.2	1486.1	1484.1		1488.2		1484.3	1487.4			1482.5		1481.1					1485.3
20S-10W	1484.4		1485.1	1484.2															1486.5

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
20S-5W	1483.7		1484.6	1484.0															1487.0
20S-0W																			1483.3
22S-40W	1484.2	1486.3		1487.0		1484.5		1486.3		1481.3	1481.1	1481.0	1480.6	1481.1					
22S-35W	1483.9	1490.8	1487.1	1484.9		1488.1	1486.3	1490.2		1481.5	1480.9	1480.7	1481.9	1481.0					
22S-30W	1483.7	1485.4	1486.7	1484.6		1486.4	1485.5	1485.9		1481.0	1480.8	1480.7	1482.0	1481.3					
22S-25W	1483.6	1485.3	1484.2	1486.7		1483.5	1486.7	1488.5	1486.7	1481.0	1481.3	1480.8	1480.6	1481.1					
22S-20W	1488.1	1484.8	1487.2	1484.4		1483.7		1484.4	1486.0			1481.0		1481.0					
22S-15W	1486.2	1484.2	1484.3	1484.8		1483.5		1484.6				1481.2		1481.1					1483.2
22S-10W	1489.6		1485.7	1487.8		1484.5													1483.5
22S-5W	1483.7		1486.8	1484.4															1484.3
22S-0W	1483.8																		
24S-40W	1483.8	1485.8		1486.1		1484.5		1489.2		1481.6	1481.2	1481.0	1480.5	1482.0	1480.8				
24S-35W	1483.7	1485.4	1485.2	1485.0		1484.0		1489.0		1481.2	1481.1	1480.8	1480.5	1481.1					
24S-30W	1483.7	1484.8	1488.3	1485.0		1484.0		1486.1		1481.3	1481.0	1480.9	1480.5	1481.5					
24S-25W	1483.3	1485.5	1487.3	1484.7		1483.5		1486.9		1481.1	1481.4	1481.0	1480.7	1481.2					
24S-20W	1483.7	1489.0	1484.0	1486.1		1488.1		1486.6			1481.2	1481.1		1481.0					
24S-15W	1483.9	1488.6	1484.4	1485.1		1486.0		1486.0				1481.1		1481.0					
24S-10W	1484.5		1484.2	1484.1		1490.5								1480.9					
24S-5W	1483.6		1484.2	1484.4															
24S-0W	1488.0																		
26S-45W		1485.3				1484.2		1484.8		1481.6	1481.5	1481.2	1480.5	1483.3	1481.0				
26S-40W	1483.6	1486.1		1487.7		1483.9		1486.1		1481.5	1481.3	1481.0	1480.4	1481.0	1480.6				
26S-35W	1485.2	1485.5		1486.8		1483.9		1485.4		1481.2	1481.0	1481.0	1480.7	1481.1	1480.3				

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
26S-30W	1483.4	1486.5	1484.5	1484.0		1484.5		1490.2		1481.6	1481.1	1481.0	1480.7	1483.5					
26S-25W	1483.5	1490.3	1485.4	1484.1		1483.8		1484.5		1481.2	1481.2	1481.4	1481.2	1481.2					
26S-20W	1483.4	1484.4	1484.7	1484.2		1485.5		1487.5			1481.3	1481.2	1480.2	1481.0					
26S-15W	1484.4	1484.3	1484.2	1484.5		1484.2		1484.8				1481.3		1481.9					
26S-10W	1483.9		1484.6	1484.1		1483.7								1480.9					
26S-5W	1483.5			1484.1															
26S-0W	1484.4																		
28S-45W		1485.0				1487.2		1487.5		1481.7	1481.4	1481.3	1480.6	1481.1	1480.9				
28S-40W	1483.5	1486.9		1489.4		1483.5		1485.6		1481.5	1481.5	1481.0	1480.3	1481.2	1480.5				
28S-35W	1483.4	1485.0		1485.6		1483.5		1487.4		1481.2	1481.1	1481.0	1480.3	1481.3	1480.2				
28S-30W	1483.6	1488.5	1488.0	1486.0		1489.2		1488.7		1481.2	1481.4	1481.3	1481.2	1481.5					
28S-25W	1483.3	1484.2	1484.0	1485.0		1483.4		1487.0		1481.3	1481.3	1481.3	1480.4	1481.1					
28S-20W	1484.5	1485.4	1484.9	1487.2		1483.6		1490.8			1481.4	1481.9	1480.1	1481.1					
28S-15W	1484.1	1484.9	1484.0	1487.5		1483.7		1484.7				1481.3		1480.8					
28S-10W	1483.7		1484.2	1484.4		1483.3								1480.8					
28S-5W	1488.2			1484.1															
28S-0W	1484.9																		
30S-50W						1483.1						1481.3							
30S-45W		1487.7				1483.8				1481.7	1481.3	1481.3	1480.1	1481.1	1480.5				
30S-40W	1483.3	1484.5		1487.1		1483.3		1485.7		1481.4	1481.5	1481.1	1480.2	1481.0	1480.2				
30S-35W	1485.4	1485.2		1484.8		1483.6		1485.3		1481.2	1481.0	1481.0	1480.1	1481.2	1480.0				
30S-30W	1485.1	1484.2		1486.7		1484.1		1484.6		1481.2	1481.2	1481.2	1480.2	1481.1	1479.9				
30S-25W	1483.3	1484.0	1490.3	1487.8		1483.4		1486.1		1481.3	1481.2	1481.6	1480.0	1480.9					

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
30S-20W	1483.7	1485.0	1484.4	1484.2		1483.4		1484.7			1481.2	1481.3	1479.9	1481.8					
30S-15W	1484.1	1490.9	1484.4	1484.7		1483.7						1481.3	1479.9	1481.3					
30S-10W	1483.5			1486.9		1483.2								1480.7					
30S-5W	1483.5			1485.8															
30S-0W	1483.5																		
32S-50W		1488.4				1483.5				1481.7	1481.5	1481.3	1479.8	1481.0	1480.4				
32S-45W		1484.5				1483.1				1481.6	1481.3	1481.1	1480.0	1481.0	1480.3				
32S-40W	1483.8	1484.3		1485.8		1483.7				1481.4	1481.4	1481.1	1480.0	1480.9	1479.8				
32S-35W	1486.8	1485.3		1483.7		1483.5		1485.4		1481.2	1481.1	1481.0	1480.2	1481.0	1479.6				
32S-30W	1483.4	1484.4		1484.8		1483.8		1484.0		1481.8	1481.1	1481.4	1479.8	1481.1	1479.5				
32S-25W	1483.2	1486.6		1485.6		1483.5		1485.1		1481.4	1481.2	1481.2	1479.7	1480.7					
32S-20W	1483.5	1484.0		1484.0		1483.3					1480.9	1481.1	1479.5	1480.7					
32S-15W	1483.8	1485.2		1484.5		1484.0						1481.4	1479.4	1480.6					
32S-10W	1484.0			1484.1		1483.1								1480.5					
32S-5W	1483.2																		
32S-0W	1483.9																		
34S-50W		1485.7				1486.0				1481.6	1481.3	1481.3	1479.3	1480.8	1480.4				
34S-45W		1483.8				1482.8				1481.4	1481.1	1481.0	1479.2	1480.7	1479.8				
34S-40W	1482.9	1484.2				1483.2				1481.3	1481.0	1481.2	1479.4	1480.8	1479.3				
34S-35W	1482.9	1485.3		1485.5		1483.5				1481.2	1481.0	1481.1	1479.5	1480.9	1479.2				
34S-30W	1482.9	1485.8		1485.8		1483.5				1481.1	1481.1	1481.1	1479.4	1480.7	1479.3				
34S-25W	1483.0	1484.3		1490.4		1483.8				1481.2	1480.9	1481.1	1479.6	1480.4					
34S-20W	1484.1	1488.2		1483.5		1483.1					1481.0	1481.0	1479.1	1480.3					

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
34S-15W	1483.3			1484.3		1482.9						1481.0	1479.1	1480.5					
34S-10W	1483.4			1484.1		1483.0								1480.3					
34S-5W	1483.6													1480.4					
34S-0W	1483.0																		
36S-55W											1481.7	1481.1	1478.7						
36S-50W						1482.7				1481.5	1481.2	1481.1	1478.7	1480.4	1479.4				
36S-45W		1483.9				1484.0				1481.3	1481.4	1480.9	1478.5	1480.3	1479.7				
36S-40W	1482.7	1483.6				1482.9				1481.0	1480.7	1480.8	1478.8	1480.4	1478.6				
36S-35W	1482.7	1483.4		1484.2		1482.9				1481.0	1481.6	1480.9	1478.9	1480.4	1478.5				
36S-30W	1482.7	1484.4		1489.6		1482.7				1482.1	1480.8	1480.9	1478.9	1480.3	1478.4				
36S-25W	1482.9	1484.2		1484.4		1483.5				1480.9	1480.7	1480.9	1478.9	1480.1					
36S-20W	1483.1	1484.4		1483.3		1482.8					1480.6	1481.1	1478.6	1480.0					
36S-15W	1483.1			1484.2		1482.6						1481.0	1478.6	1480.0					
36S-10W	1483.1			1488.8		1488.5							1478.6	1480.0					
36S-5W	1482.7													1480.3					
36S-0W	1482.5																		
38S-55W										1481.1	1480.7		1477.7		1477.4				
38S-50W						1483.6				1481.3	1480.7	1481.0	1477.9	1479.9	1478.3				
38S-45W		1483.2				1484.8				1480.9	1480.3	1480.6	1477.7	1479.7	1478.2				
38S-40W		1483.7				1482.4				1480.5	1480.2	1480.6	1478.0	1480.6	1477.7				
38S-35W	1489.7	1483.4				1483.3				1480.6	1480.4	1480.9	1478.3	1480.8	1477.7				
38S-30W	1482.5	1484.0		1483.8		1482.5				1480.8	1481.0	1480.7	1478.2	1479.8	1477.7				
38S-25W	1482.3	1483.1		1483.0		1482.4				1480.6	1480.4	1480.8	1478.1	1479.7	1477.6				

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
38S-20W	1482.7	1483.0		1489.1		1482.3					1480.2	1480.5	1478.1	1479.6					
38S-15W	1482.6			1484.1		1482.4							1478.0	1479.7					
38S-10W	1482.6												1477.9	1479.6					
38S-5W	1482.7													1479.6					
40S-55W										1480.7	1479.8		1476.5		1476.1				
40S-50W										1480.7	1480.0	1480.3	1477.1	1479.2					
40S-45W						1483.9				1480.4	1479.7	1480.0	1476.9	1478.9	1477.1				
40S-40W		1482.7				1481.9				1480.1	1479.6	1480.1	1477.2	1480.7	1476.8				
40S-35W	1482.0	1483.3				1482.0				1480.4	1481.1	1480.4	1477.4	1479.3	1476.8				
40S-30W	1481.8	1482.7				1482.5				1480.3	1480.8	1480.5	1477.3	1479.4	1476.8				
40S-25W	1488.9	1482.9				1484.3				1480.2	1479.9	1480.2	1477.3	1479.4	1476.8				
40S-20W	1482.0					1488.6					1480.3	1480.1	1477.2	1479.0					
40S-15W	1483.5					1485.1							1477.2	1479.1					
40S-10W	1482.2												1477.3	1479.1					
40S-5W	1484.1													1479.0					
42S-55W										1479.5	1478.9		1475.2		1476.0				
42S-50W										1479.9	1479.1	1479.5	1475.6	1477.9	1475.8				
42S-45W						1481.0				1479.5	1478.7	1479.4	1475.8	1478.5	1475.7				
42S-40W						1481.3				1479.5	1479.0	1479.8	1476.2	1478.4	1475.4				
42S-35W	1481.1					1481.4				1479.6	1479.2	1479.8	1477.0	1479.9	1475.5				
42S-30W	1481.2					1481.3				1479.8	1479.2	1479.8	1476.4	1478.5	1475.5				
42S-25W	1488.1					1481.6					1479.3	1479.7	1476.3	1478.5	1475.3				
42S-20W	1481.6					1481.4					1479.4	1479.7	1476.5	1478.4					

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
42S-15W	1481.9					1481.6							1476.6	1478.4					
42S-10W	1482.9												1476.3	1478.4					
42S-5W	1481.5																		
44S-60W										1477.3			1474.6		1471.2				
44S-55W										1478.5	1477.7		1474.6		1473.3				
44S-50W										1478.9	1478.0		1474.3	1477.4	1475.7				
44S-45W										1478.8	1478.7	1478.8	1474.4	1477.1	1474.2				
44S-40W						1480.9				1478.5	1478.1	1479.0	1474.6	1477.3	1473.8				
44S-35W						1480.9				1479.1	1478.7	1479.0	1474.9	1477.6	1473.9				
44S-30W	1480.7					1481.2				1478.8	1478.6	1479.2	1474.8	1477.4	1473.9				
44S-25W	1481.1					1480.3					1478.3	1479.7	1474.9	1477.6	1473.8				
44S-20W	1486.2					1483.0							1474.9	1477.9					
44S-15W	1483.6												1475.0	1477.5					
44S-10W	1481.9												1474.9	1477.5					
46S-60W													1473.2		1470.9				
46S-55W										1477.8	1478.0		1472.8		1472.3				
46S-50W										1478.6	1477.6		1473.0		1473.2				
46S-45W										1477.9	1477.6		1472.9	1476.2	1473.2				
46S-40W										1477.4	1476.8	1478.3	1473.3	1476.1	1473.0				
46S-35W						1479.7				1478.1	1477.3	1479.1	1473.4	1476.1	1472.6				
46S-30W						1482.1					1477.6	1478.6	1473.4	1476.2	1472.5				
46S-25W	1485.5					1480.0					1477.9		1473.7	1477.5	1472.7				
46S-20W	1480.9												1477.0	1477.0					

Table E1 Sound speed atlas for 800 dbar floats and the SAMBA1 sound sources

SOURCE LOCATION NUMBER	46	51	52	53	54	69	75	76	77	K1	K2	K3	K4	KB	K6	B1	B2	B3	B4
46S-15W	1481.5												1473.8	1476.8					
46S-10W													1473.6	1476.9					
48S-60W															1471.2				
48S-55W													1472.1		1472.0				
48S-50W										1477.7	1476.5		1472.1		1472.4				
48S-45W										1476.7	1477.0		1471.8	1474.6	1472.3				
48S-40W										1477.2	1476.0		1472.2	1475.1	1471.5				
48S-35W											1478.2		1471.9	1475.0	1471.1				
48S-30W											1476.5		1472.8	1474.8	1471.6				
48S-25W													1472.0	1475.6	1472.4				
48S-20W													1472.9	1475.4					
48S-15W													1472.3	1475.5					
48S-10W													1472.9	1475.4					
50S-55W													1471.5		1472.6				
50S-50W													1471.1		1471.9				
50S-45W											1475.0		1470.6		1472.3				
50S-40W											1476.1		1472.2	1474.9	1470.8				
50S-35W											1475.6		1470.4	1474.9	1470.0				
50S-30W													1470.4	1474.0	1472.3				
50S-25W													1471.6	1473.6					
50S-20W													1471.1	1474.4					
50S-15W													1474.1	1474.5					

Appendix F Calibration of T and P sensors

For the 20 MARVOR floats and the VCM float of SAMBA1, T and P calibrations were done by the manufacturer (SEASCAN). The pressure strain gauge transducer (PAINE model 210-38-010-02) and temperature 100 Ω platinum resistor (HY-CAL model EL-711-T-2) were calibrated against a Heise pressure meter (certified with NIST standard at ±1 dbar over a range from 0 to 3450 dbar) and against a Sea bird thermistor (certified with NIST standard at ±0.005 °C over a range from -1 to 31 °C).

For the ALFOS, T and P calibrations were done at IFREMER metrology laboratory by Martine Cambon. The pressure transducer (DATA INSTRUMENT model EAF 7000 PSI) and temperature thermistor (YSI model 44032) were calibrated against a Desgranges et Huot model 5020 deadweight tester (certified by BNM better than 10^{-3} in relative) and a ROSEMOUNT platinum resistor model 162 CE (certified by BNM at ±0.015 °C (2σ)).

A polynomial least square fit is done on the calibration measurements. Thus, from a value given by the float transducer (in fact a frequency count), the predicted value is obtained from the polynomial expression.

Table F1 summarizes the polynomials used for MARVOR, VCM and ALFOS. n(T) is the value given by the temperature probe, N that given by the pressure gauge.

Table F1 Calibration polynomials for MARVOR, VCM and ALFOS

FLOAT TYPE	TEMPERATURE °C	PRESSURE dbar
MARVOR #101 to #120 VCM #19	$X = n/1000.$ $Y = A + BX + CX^2 + DX^3$ $T = Y/100.$	$Z = N/1000.$ $\tilde{A} = A_0 + A_1X$ $\tilde{B} = B_0 + B_1X$ $P = \tilde{A} + \tilde{B}Z$
ALFOS #02	$X = n/1000.$ $Y = A + BX + CX^2 + DX^3 + EX^4$ $T = Y/100.$	$Z = (N - 1000.)/1000.$ $\tilde{A} = A_0 + A_1X$ $\tilde{B} = B_0 + B_1X$ $P = \tilde{A} + \tilde{B}Z$

Remarks on pressure calibration

Pressure is obtained with N and n(T) (N depends on P but also on T). Thus, one determines for various temperatures T_i, the regression (degree one) polynomial coefficients, $\tilde{A}(n_i)$ and $\tilde{B}(n_i)$. Then two separate regressions (of degree one) are done on the $\tilde{A}(n_i)$ and $\tilde{B}(n_i)$ respectively. The final pressure is obtained through n(T) and Z(N) by $\tilde{A}(n) + \tilde{B}(n) \cdot Z$

ALFOS #02 calibration

Table F2 gives for ALFOS #02 the temperature calibration measurements done at IFREMER in January 1993. They corroborate those done in WHOI in March 1992. Tables F3 and F3 bis give the pressure calibration measurements done at WHOI in March 1992 and IFREMER in January 1992 respectively.

Table F2 ALFOS #02 temperature calibration (IFREMER January 1993)

FLOAT ID	T ref	n(T)	T predicted	T residual
ALFOS02	0.029	5548	0.029	-0.000
	5.014	4525	5.011	0.003
	7.511	4091	7.515	-0.004
	10.005	3698	10.012	-0.007
	12.518	3343	12.504	0.014
	15.009	3021	15.015	-0.006
	20.007	2475	20.008	-0.001
	25.000	2030	24.999	0.001

Table F3 ALFOS #02 pressure calibration (WHOI March 1992)

FLOAT ID	T ref	P ref	N	P predicted	P residual	$\tilde{A}$ and $\tilde{B}$
ALFOS 02	0.015 °C	100	1070	99.2	.8	$\tilde{A}$ = 29.86
		504	1478	503.6	.4	$\tilde{B}$ = 991.16
	n=5495	1003	1984	1005.2	-2.2	
		1503	2486	1502.7	.3	
		2002	2989	2001.3	.7	
ALFOS 02	7.005 °C	102	1080	101.4	.6	$\tilde{A}$ = 22.13
		504	1486	503.9	.1	$\tilde{B}$ = 991.34
	n=4171	1001	1989	1002.9	-1.6	
		1502	2492	1501.2	.8	
		2002	2997	2001.8	.2	
ALFOS 02	15.012 °C	102	1091	101.6	.4	$\tilde{A}$ = 11.53
		503	1496	502.2	.8	$\tilde{B}$ = 989.30
	n=3023	1001	2002	1002.8	-1.8	
		1503	2508	1503.4	-.4	
		2003	3012	2002.0	1.0	
ALFOS 02	20.028 °C	101	1092	99.9	1.1	$\tilde{A}$ = 8.97
		499	1498	501.0	-2.0	$\tilde{B}$ = 987.92
	n=2427	1000	2002	998.9	1.1	
		1503	2513	1503.7	-.7	
		2003	3018	2002.6	.4	

Table F3 bis ALFOS #02 pressure calibration (IFREMER January 1993)

FLOAT ID	T ref	P ref	N	P predicted	P residual	Ã and B̃
ALFOS 02	0.020 °C	0	949 ±7	20.3	-20.3	Ã = 71.45
		100	1050 ±10	121.5	-21.5	B̃ = 1002.0
	n=5549	500	1431 ±5	503.3	-3.3	
		1000	1929 ±3	1002.3	-2.3	
		1500	2427 ±4	1501.4	-1.4	
		2000	2927 ±3	2002.4	-2.4	
		1500	2424 ±5	1498.3	1.7	
		1000	1922 ±4	995.3	4.7	
		500	1416 ±4	488.3	11.7	
		100	1013 ±3	84.5	15.5	
		0	911 ±2	-17.7	17.7	
ALFOS 02	7.018 °C	0	911 ±2	6.3	-6.3	Ã = 94.67
		100	1010 ±1	104.6	-4.6	B̃ = 992.60
	n=4186	500	1412 ±2	503.6	-3.6	
		1000	1911 ±6	998.9	1.1	
		1500	2417 ±2	1501.2	-1.2	
		2000	2918 ±1	1998.5	1.5	
		1500	2417 ±2	1501.2	-1.2	
		1000	1912 ±1	999.9	0.1	
		500	1406 ±1	497.7	2.3	
		100	999 ±2	93.7	6.3	
		0	899 ±1	-5.6	5.6	
ALFOS 02	13.014 °C	0	935 ±7	13.9	-13.9	Ã = 78.42
		100	1027 ±4	105.2	-5.2	B̃ = 992.21
	n=3283	500	1427 ±3	502.1	-2.1	
		1000	1933 ±3	1004.2	-4.2	
		1500	2434 ±3	1501.2	-1.2	
		2000	2937 ±2	2000.3	-0.3	
		1500	2431 ±3	1498.3	1.7	
		1000	1926 ±2	997.2	2.8	
		500	1420 ±2	495.1	4.9	
		100	1013 ±2	91.3	8.7	
		0	912 ±2	-8.9	8.9	
ALFOS 02	20.003 °C	0	1126 ±35			
		100	1150 ±32			
	n=2479	500	1533 ±28			
		1000	2081 ±19			
		1500	2568 ±31			
		2000	3058 ±35			
		1500	2543 ±25			
		1000	2097 ±59			
		500	1556 ±46			
		100	1144 ±17			
		0	1008 ±17			

The resulting coefficients for ALFOS #02 are :
A=6721.6, B=-3241.11, C=750.382, D=-98.4738 and E=5.25874 for temperature. For pressure, A_0=-16.38, A_1=9.23, B_0=983.93 and B_1=1.78 (with WHOI measurements) or A_0=166.00, A_1=-17.04, B_0=963.72 and B_1=6.90 (with IFREMER measurements). This implies a difference of the order of 100 dbar between the two calibrations !

During calibration at IFREMER, the pressure counts N have presented fluctuations, particularly at high temperature (≈20 °C), as can be seen in Table F3 bis. For this reason, $\tilde{A}$ and $\tilde{B}$ have not been estimated at 20 °C. Furthermore, since the float had to live at sea near 4 °C temperatures, the $\tilde{A}(n)$ and $\tilde{B}(n)$ coefficients are obtained by a linear interpolation between those found at 0.020 °C and 7.018 °C.

The calibration for pressure done at WHOI in March 1992, did not show up the same fluctuations. It is probable that the DATA INSTRUMENT transducer or its analog-digital converter was not in a good state when calibrating it in IFREMER. Calculated pressure and perhaps temperature have to be taken cautiously.

IFREMER temperature and WHOI pressure calibration were finally chosen !

Check on SEASCAN calibration

Two SEASCAN boards (serial numbers 31 and 25 corresponding to MARVOR #101 and #106 respectively) were checked at IFREMER metrology lab in July 1993. Temperatures were checked over the range 5 °C to 20 °C and showed deviations from references comprised between +0.04 °C and -0.03 °C. Pressures were checked over the range 0-2000 dbar at various temperatures (5, 7.5, 10, 15 and 20 °C) with deviations from references comprised between +5 dbar and -2 dbar. Thus, at least for these 2 SEASCAN boards, the accuracy of ±0.03 °C on T, and ±10 dbar on P assumed by the manufacturer seems correct.

Furthermore, it should be remarked that deviations between predicted and reference values obtained by SEASCAN (there is a complete calibration sheet for each board) are generally well within the assumed ±0.03 °C and ±10 dbar accuracies (see Table F6).

As an example Tables F4 and F5 give the calibration measurements done by SEASCAN for the P and T board of VCM #19.

Table F4 VCM #19 temperature calibration

FLOAT ID	T ref	n(T)	T predicted	T residual
VCM19	0.375	1047	0.376	-0.001
	3.603	1292	3.601	0.002
	8.063	1629	8.062	0.001
	11.658	1900	11.666	-0.008
	15.769	2207	15.760	0.009
	20.125	2534	20.129	-0.004
	23.271	2769	23.270	0.001

A=-1315 (-1315.3 more exactly)
B=1267.9
C=26.83
D=-3.498

Table F5 VCM #19 pressure calibration

FLOAT ID	T ref	P ref	N	P predicted	P residual	$\tilde{A}$ and $\tilde{B}$
VCM 19	0.375 °C n=1047	0.0 98.1 294.3 490.5 981.0 1471.5 1962.0	362.0 483.0 733.0 982.0 1603.0 2222.5 2840.0	0.6 96.3 294.1 491.0 982.3 1472.3 1960.7	-0.6 1.8 0.2 -0.5 -1.3 -0.8 1.3	$\tilde{A}$ = -285.73 $\tilde{B}$ = 791.01
VCM 19	23.271 °C n=2769	0.0 98.1 294.3 490.5 981.0 1471.5 1962.0	378.0 500.5 749.5 997.5 1621.5 2239.5 2862.0	0.7 97.4 294.1 489.9 982.6 1470.6 1962.1	-0.7 0.7 0.2 0.6 -1.6 0.9 -0.1	$\tilde{A}$ = -297.75 $\tilde{B}$ = 789.61

A_0=-278
A_1=-7.0
B_0=791.9
B_1=-0.81

For the MARVORs and VCM, T and P calculations are done by the SEASCAN board microprocessor. However A, B, C and D coefficients are rounded before introduction into microprocessor memory. The number of decimal places is 0, 1, 2 and 3 respectively, which implies a maximal error of 0.005, 0.0015, 0.0005 and 0.000015 °C on the A, BX, CX^2 and DX^3 terms ($X = \frac{n}{1000.}$ varies between 1 and 3 over the temperature range 0 to 25 °C). With one decimal place for A, the overall maximal rounding error on T would be 0.0025 °C. The predicted values given in Table F4 have been obtained with that latter value for A. A comparison done between temperatures estimated with the rounded A and the "exact" A value, reveals differences of 0.003 °C at most. Since residuals between predicted and reference values are of the order of several thousandths of a degree C (without any rounding), this inaccurate A value doesn't affect really the calculation of T, that we shall assumed better than ±0.01 °C.

Table F6 below gives the polynomial coefficients used for the calculation of T and P by the 20 MARVORs (#101 to #120) and the VCM #19.

Table F6 Calibration coefficients for MARVOR #101 to #120, and VCM #19

FLOAT ID	SEASCAN board #	A	B	C	D	A0	A1	B0	B1	residuals on T (1/100 °C)	residuals on P (dbar)
MARVOR #101	31	-1393	1309.3	-0.35	0.622	-177	-1.8	733.5	-1.40	-2 to +2	-1 to +1
MARVOR #102	51	-1207	1290.2	0.14	0.612	-145	-2.4	740.5	-1.46	-1 to +2	-1 to +1
MARVOR #103	43	-1183	1285.6	4.29	0.254	-146	-4.4	746.2	-1.43	-1 to +1	-2 to +1
MARVOR #104	62	-1216	1266.6	5.42	0.795	-155	-10.0	745.5	-1.25	-2 to +1	-1 to +1
MARVOR #105	47	-1323	1311.3	-5.15	1.656	-145	-4.0	730.4	-1.27	-2 to +2	-1 to +3
MARVOR #106	25	-1291	1276.5	9.88	-0.598	-164	-4.8	713.8	-1.15	-1 to +1	-1 to +1
MARVOR #107	52	-1341	1319.9	-12.20	3.050	-197	8.5	731.0	-1.18	-1 to +1	-1 to +2
MARVOR #108	38	-1305	1303.5	-6.48	1.981	-165	3.9	732.0	-0.83	-1 to +1	-1 to +1
MARVOR #109	71	-1195	1291.6	4.99	-0.258	-177	-2.4	729.8	-11.9	-1 to +1	-1 to +2
MARVOR #110	45	-1306	1262.9	18.03	-2.308	-140	-4.0	717.2	-1.24	-1 to +1	-1 to +1
MARVOR #111	49	-1314	1305.4	-4.79	1.746	-135	-4.9	700.2	-1.42	-1 to +1	-1 to +1
MARVOR #112	53	-1349	1334.7	-21.81	4.708	-184	7.6	741.2	-1.68	-1 to +1	-1 to +1
MARVOR #113	41	-1324	1290.4	3.48	0.038	-156	0.4	733.6	-1.17	-1 to +1	-1 to +1
MARVOR #114	55	-1371	1260.8	5.64	0.869	-135	-3.3	692.4	-0.75	-1 to +2	-1 to +1
MARVOR #115	61	-1358	1307.4	-1.67	0.850	-188	2.3	733.4	-1.47	0 to +1	-1 to +1
MARVOR #116	46	-1249	1289.2	2.83	0.348	-136	-6.1	727.6	-1.14	-1 to +1	-1 to +1
MARVOR #117	50	-1313	1285.7	15.13	-1.791	-144	-1.7	706.2	-0.98	-1 to +1	-1 to +1
MARVOR #118	66	-1344	1330.8	-16.82	3.735	-179	-4.3	735.2	-1.08	-1 to +1	-2 to +2
MARVOR #119	58	-1333	1310.1	-9.91	2.674	-125	-18.3	721.4	-0.89	-1 to +1	-2 to +2
MARVOR #120	59	-1389	1315.0	-7.21	1.684	-165	-6.1	729.9	-1.28	-1 to +1	-1 to +2
VCM #19	19	-1315	1267.9	26.83	-3.498	-278	-7.0	791.9	-0.81	-1 to +1	-2 to +2

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EPILOGUE AND ACKNOWLEDGEMENTS

The SAMBA program was conceived in the late 1980s as a contribution to the WOCE program. At first, a global mapping of the entire South Atlantic north of 35°S was envisaged with more than 200 floats acoustically followed for at least a 5-year duration. This stimulated the development of a new kind of float, the MARVOR float.

MARVOR float development proper took place between 1989 and 1993 and required much more time, energy and manpower than previously anticipated. By the end of 1993 we were inclined to consider MARVOR ready for deployement in the South Atlantic. Thus in February 1994 we launched the first 20 serial MARVOR floats in the Brazil basin.

Meanwhile, the software necessary for the float data processing and acoustic tracking was developed from 1991 onwards, by a full-time programmer from our own former SOFAR tracking software (Ollitrault, 1987). However we soon became aware that the people necessary to test and prepare more than 200 floats over a 2-year period would never be available. Even more uncertain was the processing of the great amount of data that would be generated before the end of the 20th century. We decided consequently to reduce the float number to 100 and to concentrate only on the Brazil basin and the equatorial Atlantic, which proved easier and rewarding within the framework of the international DBE experiment.

The SAMBA1 float data over the first year and a half was processed in quasi real time and we hope to be able to continue in the same way for the future cycles and floats.

Many people have contributed to the MARVOR development and the SAMBA experiment. Strong support from P. Papon, head of IFREMER, E. Cailliau, J.P. de Loof, B. Voituriez and A. Colin de Verdière were much welcomed and are warmly acknowledged. J.Y. Bervas, J. Legrand, T. Lemoign and J.F. Rollin also contributed to MARVOR. C. Dumortier and J. Moliéra from Tekelec spent much of their time making the floats meet our requirements. Y. Camus and D. Guével from the french hydrographic office allowed the recuperation of 3 prototype floats in 1993, on which a major defect was disclosed, and later on remedied.

A first version of the tracking software was carefully written by P. Caprais from CR2A (a software company) in 1991 and 1992.

Gilberto G. Fonseca de Moura from the brasilian embassy in Paris made it possible to obtain the necessary authorization to launch floats within brazilian waters.

The two brazilian scientists (Mauricio Magalhães Mata from the Fundação Universidade do Rio Grande and Lucia Verçosa Carvalheira from the Universidade do Estado do Rio de Janeiro) and the military observer (Ct Jose Ricardo dos Santos), that came on board in Montevideo, kindly participated in all the operations at sea, which was a great help. Robert Tavares from WHOI, besides his RAFOS deployment, delighted us with his folk music recordings, while Valérie Baty made our cruise enjoyable thanks to her filming our scientific and technical work. Finally the SUROIT crew and its captain M. Houmard deserve sincere thanks for the perfect realization of the SAMBA1 cruise.

Errata sheet
for

Rapports Scientifiques et Techniques de l'IFREMER
n°11 - 1988
DEEP SOFAR FLOAT EXPERIMENT IN THE NORTH-EAST ATLANTIC
by
Michel OLLITRAULT, Pierre TILLIER, Isabelle BODEVIN and Holger KLEIN

- Page 13 : Launch point of float 71 is 47°37.1'N-19°42.9'W.

- Page 31 : In table 3 the $\bar{y}$ and $\bar{u}$ columns are slightly erroneous. In the $\bar{y}$ column, values should be 0, 11, 125, -176, -66, -198, 19, -199, -38, 148, -177, -96, -225, -14, 192 from top to bottom.

In the $\bar{u}$ column, values should be 0.7, -1.1, -1.1, 0.0, -0.5, 0.1, 0.3, -0.1, -1.1, -0.4, -0.1, -0.1, -0.1, 0.5, -0.2 from top to bottom.

Correspondingly, the individual float statistics must be edited : the following table gives the exact values that replace erroneous values given in section 5 of the data report.

Float n°	Eastward displacement	Mean eastward velocity	Northward displacement	Launch longitude
57		-0.16	191.6	
68		0.71		
69		-1.09	11.3	
70		-1.05	124.9	
71			-175.7	
72		-0.50	-65.5	
73		-0.05	-198.3	
74		0.26	18.7	
75		-0.11	-199.3	
76	-124.8	-1.07	-37.7	-20.06 W
78		-0.37	148.2	
79		-0.11	-176.9	
80		-0.11	-95.5	
81			-225.2	
82		0.56	-13.7	

- Page 117 : Acoustic power emitted omnidirectionaly is roughly 70 W (not 7 W).

Errata sheet
for

Repères Océan n°7 - 1994
THE TOPOGULF EXPERIMENT LAGRANGIAN DATA
by
Michel OLLITRAULT

- Page 8, line 9, replace insonify by cover.
- Page 82, suppress the 10^6 factor in the right part of Eq.1.
- Page 84, line 8 from the bottom, replace near neighbour by nearest neighbour.
- Page 617, in the expressions giving the variance, replace $\sum_{r=-(n_l-1)}^{n_l+1}$ by $\sum_{r=-(n_l-1)}^{n_l-1}$.
- Page 618 and 619, replace $(m-|m|+k)$ where it occurs by $(m-|m|-k)$.

Pendant la campagne SAMBA 1 en février 1994, neuf stations hydrologiques CTD ont été effectuées et vingt-deux flotteurs de subsurface (20 MARVORs, un VCM et un ALFOS) lâchés vers 800 m de profondeur dans le bassin du Brésil. SAMBA (pour SubAntarctic Motions in the Brazil BAsin) est une composante du programme flotteur de l'expérience WOCE, et vise à décrire la circulation générale et absolue de l'Eau Antarctique Intermédiaire, vers 800 m de profondeur dans le bassin du Brésil et la bande équatoriale.

Les flotteurs MARVOR et l'ALFOS sont de type RAFOS mais cyclent périodiquement entre leur profondeur de consigne et la surface pour retransmettre leurs informations via les satellites du système ARGOS. Ils ont été programmés pour 30 cycles de 2 mois, soit une durée de vie de 5 ans. Le flotteur VCM, par contre, est un flotteur de type RAFOS "à un seul coup", et avait été programmé pour une mission de un an et demi en profondeur.

Ce rapport présente les données hydrologiques et les 18 premiers mois de données flotteurs.

En tout 10 560 jours (soit 28,9 années) de données flotteurs ont été récupérés par les 20 flotteurs MARVOR, dont 97 % concernent l'intervalle de pression [700,900] dbar. En outre, 540 jours de données ont aussi été récupérés par le VCM, mais dans l'intervalle de pression [900,1 000] dbar. L'ALFOS, pour sa part, n'a pas très bien fonctionné puisque nous n'avons pu calculer aucune position "acoustique".

Les dix flotteurs MARVOR, lâchés en deux paquets au sud de la chaîne de monts sous-marins Vitoria-Trindade (située vers 21 °S), montrent un mouvement d'ensemble vers l'ouest sud-ouest, associé vraisemblablement au quart nord-ouest du tourbillon anticyclonique subtropical.

Les dix flotteurs (9 MARVORs et l'ALFOS), lâchés aussi en deux paquets mais au nord de la chaîne Vitoria-Trindade, révèlent qu'il n'y a pas de mouvement d'ensemble après un an et demi, mais seulement une circulation turbulente d'échelle moyenne avec tendance à une dispersion plutôt zonale.

Contrastant avec le calme relatif de l'intérieur (les vitesses quadratiques moyennnes sont d'environ quelques cm s^{-1}), les deux flotteurs (un MARVOR et un VCM), lâchés près de Salvador da Bahia au-dessus de la pente continentale, ont été entraînés rapidement vers le nord et en restant collés à la pente continentale, ce qui démontre la présence d'un courant de bord ouest aux profondeurs intermédiaires (800 à 900 dbar). Ce courant intermédiaire de bord ouest, intense (de l'ordre de 0,5 nœud) et étroit (largeur de l'ordre de 50 km), a en fait été revélé entre 25° S et 2° S, par plusieurs flotteurs "intérieurs" qui y ont été entraînés pour en être expulsés quelques mois plus tard.

In February 1994, during the SAMBA 1 cruise, 9 CTD casts were done and 22 subsurface RAFOS-type floats (20 MARVORs, 1 VCM and 1 ALFOS) launched near 800 dbar in the Brazil basin, within the framework of the SAMBA experiment. SAMBA (SubAntarctic Motions in the Brazil BAsin), is a component of the WOCE float program, and aims at describing the absolute general circulation of the Antarctic Intermediate Water around 800 m depth in the Brazil basin. MARVOR and ALFOS floats cycle every 2 months between their nominal depth and the surface to transmit data via the ARGOS system and were programmed for 30 cycles, i.e. a total life of 5 years. The VCM float, on the other hand is a one shot float which was programmed for a 1.5 year mission at depth.

This report presents the hydrographic data and the first 18 months of float data obtained so far.

10560 float-days (or 28.9 float-years) have been recovered with the 20 MARVORs, of which, 97 % are in the [700,900] dbar pressure interval. 540 float-days were also recovered with the VCM, in the [900,1000] dbar pressure interval, but the ALFOS didn't work so well since we were not able to retrieve any acoustic position.

The 10 MARVOR floats launched in 2 clusters south of the Vitoria-Trindade seamount chain (situated near 21°S) show clearly a mean westward motion associated probably with the northwestern limb of the subtropical anticyclonic gyre, which spans the entire South Atlantic between 45° S and 25° S.

The 10 floats (9 MARVORs and the ALFOS) launched in 2 clusters north of the Vitoria-Trindade chain, reveal almost no mean motion over the 1.5 year but a rather zonal mesoscale dispersion.

As a contrast with the rather quiet interior (rms velocities are of the order of a few cm s^{-1}), the 2 floats (1 MARVOR and the VCM) launched near Salvador da Bahia, over the continental slope, were soon advected northward and fast along the coastline showing the presence of a western boundary current at intermediate depths (800 to 900 dbar). This strong (0.5 knot) and narrow (50 km wide) intermediate western boundary current has been actually revealed from 25° S to 2° S by several "interior" floats entrained within it on occasion, to be detrained a few months later.

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